A

SYSTEM

OF

MATERIA MEDICA

AND

PHARMACY:

INCLUDING TRANSLATIONS OF

THE EDINBURGH LONDON, AND DUBLIN PHARMACOPŒIAS.

BY

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FROM THE FOURTH AND LAST EDINBURGH EDITION.

WITH NOTES AND ADDITIONS

BY

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TO

JOHN AUGUSTINE SMITH, M.D.

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THE PRESENT EDITION OF THIS WORK IS DEDICATED,

AS A SLIGHT EVIDENCE OF THE RESPECT ENTERTAINED

FOR HIS CHARACTER AND TALENTS,

BY HIS FRIEND AND COLLEAGUE,

THE EDITOR.

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Preface to the Third Edition,

BY THE AUTHOR.

This Treatise, on a more limited scale, was originally designed to afford an Outline of the Course of Lectures I deliver on Materia Medica and Pharmacy. Having changed the plan of arrangement of these Lectures, its republication appeared to me unnecessary, and it was only in consequence of the continued demand for it, after the impression had been exhausted, that I was induced again to publish it ; and at the same time, as it was no longer subservient merely to its first design, to enlarge it so far as to form a System which should include the principles, and the more important facts belonging to these departments of Medical Science.

The arrangement of the Materia Medica which I have followed, is that in which the individual substances are connected by their medicinal relations, an arrangement which has some important advantages, and which presents its objects under a scientific form. The processes of Pharmacy I have considered in the order in which they are given in the Edinburgh Pharmacopœia, to a translation of which I have added translations of the London and Dublin Pharmacopœias, in the same order. The analogous processes in all of them are thus placed together, and a full view of Pharmacy, as regulated by the respective Colleges, is exhibited ; while advantage is derived from the processes being compared.

In an Appendix to the history of the Materia Medica at the end of the first volume, I have given a view of that arrangement, in which the substances belonging to it are classed according to their natural affinities. This, besides affording a contrast with the classification according to their medicinal powers, will be of some advantage to those attending my Lectures, and enable them to derive more assistance from the present publication as a text-book, as it presents an outline of the arrangement of the Course. By the aid of the Index, it is easy to render it subservient to this use.

INTRODUCTION.

Medical Science, considered as relating to the treatment of disease, may be presented under two points of view. Under one, diseases are defined and classed; their symptoms are described, their causes investigated, the indications are delivered by which their cure is to be attempted, and the remedies are enumerated by which these indications are to be fulfilled. When this method is followed, a previous knowledge is supposed of the natural history, and the properties of the substances employed as remedies; and they are no farther subjects of attention, than in so far as regards their applications to particular cases, and the cautions which peculiarity of circumstances may render necessary in their administration.

But the subject may also be presented under another aspect. The symptoms of diseases, their causes, and indications of cure, may be supposed to be known, and the remedies themselves become principally the objects of study,—their natural characters, their sensible qualities, their effects on the living system, the theory of their action, and their applications to the treatment of morbid affections, forming so many subjects of description or investigation. This constitutes the department of Materia Medica,—understood in the most extensive signification of the term.

The medicinal powers of natural bodies are connected with their chemical constitution; they often reside, not in the entire matter composing them, but in principles capable of being extracted in an insulated state, and which in this state can be employed with peculiar advantages. When given in combination too, these substances are liable to act on each other, and from these mutual actions, to suffer alterations in their properties. Hence arises the necessity of strict attention to their chemical composition; and a description of their constituent principles, and of their chemical relations, so far as these influence their actions as remedies, belongs to this department of Medicine. We are also often able, by chemical combinations, to modify the powers of these substances, to give them more activity, and even by the production of new compounds, to obtain remedies which nature does not afford. These are the leading objects of Pharmacy, which is thus evidently subordinate to Materia Medica.

Regarding all these objects of inquiry as belonging to one department of Medicine, it includes three general divisions. Under the first may be delivered those principles which are common to Materia Medica and Pharmacy, which embrace the chemical relations of bodies, and the changes to which they are liable, so far as is connected with their medicinal operations,—forming what may be named Pharmaceutic Chemistry. Under the second is placed the history of the substances employed as remedies, constituting what is regarded as Materia Medica in the more limited sense attached to the term. And under the third may be considered the processes to which these substances are subjected, with the view of preparing them for administration, forming what is more strictly denominated Pharmacy. On these divisions is founded the arrangement of this Work.

PART I.

OF THE GENERAL PRINCIPLES OF PHARMACEUTIC CHEMISTRY.

Pharmaceutic Chemistry is that branch of chemical science which investigates the composition of bodies, and considers their mutual chemical relations, so far as these are connected with their medicinal properties and applications. It connects the doctrines of Materia Medica and Pharmacy, and forms a proper introduction to the study of each: an exposition of its principles being necessary to the history of the articles of the Materia Medica, and being not less indispensable in explaining the operations of Pharmacy. It includes two subjects; *first*, the analysis of bodies, so far as relates to the enumeration of their constituent principles; and, *secondly*, the general operations to which they are subjected in their preparation as remedies.

CHAPTER I.

OF THE CHEMICAL ANALYSIS OF THE ARTICLES OF THE MATERIA MEDICA.

The ultimate object of chemical investigations, is to discover the composition of bodies; and the result of these investigations is the reducing them into two classes, those which are Simple, and those which are Compound. The former are such as consist of parts perfectly alike; the most minute particles into which a simple body can be resolved, retaining all its essential properties, and being similar to each other. The latter can, on the contrary, be resolved into substances different in their qualities from each other, and from the compound which they form.

It is from the union of simple substances that compounds are produced. When two simple bodies are placed under those circumstances which favour the exertion of their mutual attraction, they unite and form a compound, having peculiar properties. These compounds are farther capable of combining with other simple bodies, or with each other, which gives rise to a series of bodies still more extensive; and these again are capable of new combinations, or of such intimate mixtures with each other, as to form many peculiar substances. There are thus produced

from a few simple substances, all the products of nature, and all those which are the results of the operations of art.

It is the province of Chemistry to trace these combinations; to determine whether bodies are simple or compound; and, if compound, to ascertain the number of their constituent principles, the proportions, and the modes in which they are combined,

The general process by which these objects are attained, is termed, in the language of Chemistry, Analysis. It is merely the separation of a compound body into its constituent parts, and is effected either by the agency of heat, or by the exertion of a superior attraction.

The analysis from the application of heat, differs according to the composition of the body analysed. If a compound consisting of two simple substances, be exposed to heat, it in many cases happens, that the mutual attraction by which its principles were united ceases, and a decomposition or separation of these principles takes place. This is an example of pure analysis; no change being produced, but merely the separation of the component parts of the compound, so that each is obtained in its original state.

An analysis more complicated is that where several substances are combined together, in such a manner that their attractions are balanced and one compound is formed. When a compound of this kind is exposed to a high temperature, this balance is frequently subverted, and it suffers decomposition. But its constituent principles, instead of passing off pure, enter into new combinations with each other, and form other compounds, each of which may be collected, and in its turn analysed. It is in this manner that vegetable and animal substances are acted on by heat; the products afforded by their analysis are not such as pre-existed in them, but are compounds formed during the decomposition, by new combinations of their ultimate principles. This is what has been named False or Complicated Analysis.

Chemical Analysis is also effected by the exertion of a superior attraction. If a compound be placed successively with different substances in situations favourable to the operation of chemical action, one or other of them may exert superior attraction to either of its component parts; a decomposition will be produced, and from the products the constituent principles of the compound, as well as their proportions, may be determined.

As compound substances can combine together so as to form a new compound, it is obvious, that this compound may be resolved either into the immediate principles from the union of which it has been formed, or into those of which these consist. It is necessary, therefore, that these should be distinguished. The former are accordingly named the Proximate Principles of a compound; the latter the Ultimate Principles. The proximate principles are compounds; the ultimate principles are the elements of these compounds; and the results of analysis are extremely different, according as one or other of these is obtained.

When by analysis the constituent principles of a body have been obtained, they may often be combined, so as to reproduce the substance analysed. This operation is named Chemical Synthesis. and, when it can be effected, is the surest proof of the accuracy of the analysis. It is seldom that it can be applied to those compounds which suffer a complicated analysis; and hence the composition of vegetable or animal substances can scarcely be confirmed by a synthetic experiment.

In analysing the various products of nature, we arrive ultimately at substances which we are unable to decompose, and which are therefore regarded as simple. The absolute simplicity of these is not indeed established; for our inability to decompose them may not arise from this, but from the imperfections of our modes of analysis; and it is even probable, that all the substances which are yet known to us may be compounds, and that a more refined chemistry may discover their composition. Until this be effected, however, they are regarded as simple, and they are so with regard to our knowledge of them. As the ultimate principles, therefore, of all analysis, they are first to be considered in proceeding to the general analysis of the articles of the Materia Medica.

Of these bodies, Oxygen is the most important. There is no simple substance which exerts an attraction to so many others, or which gives rise to such important compounds. With a few exceptions, indeed, all the productions of nature are either capable of combining, or are already combined with this principle, and the developement of its agencies constitutes the most extensive and important part of chemical science.

Oxygen, when uncombined, always exists in the gaseous state; and its descriptive characters are therefore taken from it as it exists in this state. Like other gases, it is invisible and elastic; its specific gravity is rather greater than that of atmospheric air; it is absorbed by water, but in a very small proportion.

The distinguishing properties of oxygen gas are those of supporting respiration and combustion. An animal lives longer in this air than it does in any other; and combustion in it is more vivid, and continues longer. It is the only air, indeed, which, strictly speaking, can support either of these processes; other aëriform fluids doing so only from the oxygen they contain. Iodine and Chlorine, if the views of Sir H. Davy, and the other advocates for the chlorine theory be just, are to be considered as simple supporters of combustion.

Its capacity of supporting combustion is more particularly to be assumed as its characteristic chemical property; combustion being the combination of oxygen with combustible bodies, accompanied with the emission of heat and light. It also frequently, however, enters into combination without the phenomena of combustion being apparent, more especially when the absorption of it takes place slowly, or when it is transferred from a compound in which it exists to another substance. The combination of a body with oxygen is termed Oxygenation, or Oxidation. The products of this combination have either certain common properties, belonging to a class of chemical agents long distinguished by the appellation of Acids; or they are destitute of these properties, and they are then denominated Oxides.

Oxygen forms one-fourth part of atmospheric air; and it is principally on its agency that the many chemical changes produced in bodies by that air depend. Combined with another elastic fluid, hydrogen, in the proportion of 87 parts to 13, it forms Water, the substance which has the most extensive operation in promoting chemical action by the fluidity it communicates, and which more directly produces important chemical changes, by affording oxygen to the bodies. Oxygen exists too as a constituent principle of acids, and communicates to them their energy of action. It is an ingredient in the composition of the alkalis and earths, and is therefore the principle of alkilinity as well as acidity. With all

the metals it combines, communicating to them a greater susceptibility of chemical action, and greater activity in their relation to the living system; and it exists as a constituent part of nearly all the vegetable and animal products. Hence no principle is more extensively diffused, and none has a more marked influence in the combinations into which it enters.

The elastic fluid which, with oxygen gas, composes atmospheric air, is named AZOTE or NITROGEN. It too is a simple substance; at least though there may be some reason to believe it is a compound, it has not been decomposed. Its chemical agency is less powerful than that of oxygen, nor does it possess any very remarkable property by which it can be characterized; it is distinguished rather by negative qualities. It is lighter than oxygen gas, is incapable of supporting combustion or respiration, is scarcely sensibly absorbed by water, and is not combustible in the strict sense of the term; for although it combines with oxygen, the combination is not rapid; it does not, after it has commenced, proceed of itself, and is not attended with any sensible emission of heat or light.

Nitrogen gas forms nearly four-fifths of atmospheric air, the remaining fifth being oxygen gas. In more intimate combination with oxygen, and in that proportion in which they are mutually saturated, it forms a powerful acid, the nitric acid; and in lower degrees of oxygenation it forms compounds, nitric oxide and nitrous oxide, which have no acid powers. With hydrogen it forms ammonia, one of the alkalis; it exists in some vegetable substances, and is a constituent principle of nearly all the varieties of animal matter.

ATMOSPHERIC AIR, of which oxygen and nitrogen are the essential constituent parts, has merely the aggregate properties of these two gases, their combination being so slight, that no new powers are acquired from it; and, as the oxygen is the more energetic ingredient, the chemical agencies of this air depend chiefly on the operation of this principle. It yields oxygen to a number of substances, with more or less rapidity, and thus changes their chemical constitution. It sometimes acts too by communicating humidity: and in a few cases, by affording an elastic fluid, carbonic acid gas, which is diffused through it in small proportion. Its nitrogen exerts no active power, but apparently serves merely to dilute, and thus to moderate the action of the oxygen gas.

HYDROGEN is another elastic fluid, which in the system of modern chemistry has been regarded as elementary. In its aërial form, in which form only it can be obtained uncombined, it is the lightest of all the elastic fluids, and the lightest substance, therefore, whose gravity we can ascertain. It is distinguished farther by its high inflammability; it burns when an ignited body is approached to it in contact with atmospheric air, and explodes if previously mixed with the air. The product of its combustion is water, which is therefore a compound of it with oxygen.—Combined with nitrogen, it forms ammonia; with the primary inflammables, sulphur, carbon, and phosphorus, it forms compound gases: it dissolves even some of the metals, and it is an abundant ingredient in vegetable and animal substances.

WATER, which is a compound of hydrogen and oxygen, is a substance extremely peculiar in its chemical relations. Its power of combination is extensive, there being few substances on which it does not act, or with which it does not combine; yet in the greater number of these combinations no energetic action is displayed: it scarcely produces any altera-

tion of properties: and hence its most important operation is the communicating that state of fluidity to bodies which is necessary to their mutual chemical actions. It is more peculiarly the solvent of all saline substances, and of the greater number of the earths; and it dissolves many of the vegetable and animal products. In some bodies, however, particularly in the powerful acids, and in the alkalis, it exists in intimate combination in certain definite proportions. When it communicates oxygen, it produces important changes. Several of the metals are slowly oxidated by it; and when they are dissolved by acids, it often acts by affording to them that oxygen which is necessary to the solution. Vegetable and animal substances often suffer chemical changes from the oxygen which water imparts, as well as from the fluidity it communicates, favouring the re-action of their constituent parts; and in their decomposition at elevated temperatures, the elements of the water they contain, enter into the composition of the products which these decompositions afford.

There are three simple substances distinguished by the property of inflammability, and hence named Simple Inflammables, which exist as constituent principles of a number of natural products. These are carbon, sulphur, and phosphorus. They are destitute of the metallic splendour, opacity, and specific gravity, and are connected chiefly by the common property of inflammability. When united with oxygen, they form acids.

Carbon. The ultimate base to which the name of carbon ought to be appropriated, is perhaps, still unknown; but there are several substances of which it constitutes the greater part, and in which it appears to exist nearly pure. Wood charcoal in burning is almost entirely consumed, forming with the oxygen with which it combines a peculiar elastic fluid, carbonic acid, and leaving only a small residuum of earthy, saline, and metallic substances. As a discriminating appellation of the pure inflammable matter which thus combines with oxygen, the term Carbon was introduced, and it denotes, therefore, this matter free from the other substances mixed with it in charcoal, and not essential to its constitution. It was afterwards discovered, that the Diamond, which was known to be a combustible body, affords in burning the same product as charcoal, and hence therefore consists of the same inflammable matter. Different opinions were advanced with regard to the difference between charcoal and diamond; as they combine in burning with the same proportion of oxygen, and afford precisely the same product, the difference appears to be merely in aggregation; charcoal in its common state, however, always contains a portion of hydrogen, and it is doubtful if it can be entirely freed from it. In the substance named Plumbago, the carbonaceous base is united with a small quantity of iron. It is to the inflammable matter common to all these substances, composing nearly the whole of the weight, and forming with oxygen a peculiar acid, that the term carbon is appropriated.

Carbon, besides existing as an element in the composition of many mineral substances, is an abundant ingredient in the products of the vegetable and animal systems. Not being volatile, it forms the principal part of the residual mass when these are decomposed by heat; and it is by this decomposition of vegetable matter, especially of the wood of plants, that it is obtained in the form of charcoal. With oxygen, combined in dif-

ferent proportions, it forms two elastic fluids, Carbonic oxide, and Carbonic acid. With hydrogen, or with hydrogen and oxygen, in different proportions, it forms various inflammable gases, named carburetted, or oxy-carburetted hydrogen gases. Alcohol, or pure ardent spirit, which is the product of the fermentation of saccharine matter, is a similar compound; and ether, which is formed from alcohol by the action of acids upon it, is of the same composition with a larger proportion of hydrogen. Lastly, the ternary combination of carbon, hydrogen, and oxygen, in various proportions and modes of combination, appears to constitute the principal varieties of vegetable matter.

Sulphur is found in nature principally as a constituent part of mineral bodies. It exists combined with many of the metals; and united with oxygen, forming sulphuric acid, it enters into the composition of a number of saline and earthy compounds. It is highly inflammable; in burning it combines with oxygen, principally in that proportion which forms an elastic fluid, pungent and suffocating, sulphurous acid. With a larger proportion of oxygen, it forms a dense inodorous liquid acid, sulphuric acid. With hydrogen, it forms an inflammable gas, Sulphuretted Hydrogen, which exists in nature impregnating water in the sulphurous mineral waters; and which presents the singular anomaly that it is possessed of the properties of an acid, though it does not contain any oxygen in its composition. This compound alone, or with an additional proportion of hydrogen, forming what is named super-sulphuretted hydrogen, enters into combination with alkalis, earths, and metallic oxides, forming several important pharmaceutic preparations. Lastly, sulphur exists as a constituent part of animal substances: hence sulphuretted hydrogen is evolved in the decomposition of these by heat or putrefaction: it has also been detected in the composition of a few vegetables.

Phosphorus exists chiefly as an ingredient of animal matter. Combined with oxygen, in the state of an acid, it also enters into the composition of several products of the mineral kingdom. It is of a soft consistence like wax, semi-transparent, and of a white or yellowish colour; it is so highly inflammable, that it burns spontaneously when exposed to the air. It combines with two proportions of oxygen, forming two acids, the phosphorous and the phosphoric. With hydrogen it forms a gas, phosphuretted hydrogen, highly inflammable; and it unites with sulphur and with the metals.

The class of Metals is an extensive one, a number of substances having been discovered by the researches of chemists, which belong to it, besides those which are generally known. The physical properties, characteristic of the metals, are opacity, great lustre, density, ductility, and malleability. These are possessed in different degrees by the different metals; and if the bases of the alkalis and earths are to be admitted as metals, the property of density cannot be considered as distinctive, as some of these are even lighter than water. With regard to chemical properties, the metals are fusible, in general not volatile except at very intense heats; they are capable of combining with oxygen, with hydrogen, sulphur, carbon, and phosphorus, with each other, and when oxidated they unite with acids, alkalis, and earths.

Of these combinations, that with oxygen is the most important; and in relation to the object of this outline, that principally which requires any further observations. This combination is effected in various modes.

When heated in contact with the air, they attract its oxygen : if the temperature be highly elevated, they display during this oxidation the phenomena of combustion ; even if the temperature is less elevated, several of them burn more or less rapidly ; but the greater number are oxidated more slowly, and without any sensible light. Several metals are slowly oxidated by water, or by the joint action of air and water at natural temperatures. And all of them can be oxidated by acids, the acid either directly imparting oxygen to the metal, or enabling it to attract this principle from the water which is present.

The compounds of metals with oxygen belong in general to the order of oxides. They are destitute of the physical properties of the metals, and have an earthy-like appearance. Two or three metals acquire, in their highest state of oxygenation, acid powers.

In combining with oxygen, different metals unite with very different quantities of it. Each of them combines too with different proportions of oxygen, giving rise to the production, from the same metal, of oxides having different properties. And these different oxides form the bases of compounds with acids, which are often also extremely dissimilar,—a circumstance of much importance, as is to be afterwards pointed out, with regard to the pharmaceutical processes on the metals.

When the metals are combined with oxygen, they become capable of combining with the acids, and in doing so they acquire greater activity and power of chemical action. This previous oxidation of a metal is always necessary to its combination with an acid, and hence, when acids act on metals, they first impart to them oxygen, or enable them to attract oxygen from the water, or sometimes from the air, and then combine with the oxide that is formed. As the same metal is capable of existing in different states of oxidation, so by combining in these states with the same acid, it forms very different compounds ; and these compounds are farther diversified by the different proportions of acid combined in them.

Metals are rendered active on the living system, principally by being combined with oxygen, or farther combined with acids. In their metallic state, they seldom produce any sensible effect ; and any effect they do produce appears to arise from their being chemically acted on by the gastric fluids. When oxidated, they become more active ; and still more so when the oxide is combined with an acid. And even the degree of oxygenation considerably influences their powers ; so that from the same metal preparations of very different degrees of medicinal activity may be obtained, though all agreeing in the kind of action they exert.

Metals, both in their metallic form and in the state of oxide, combine with sulphur and sulphuretted hydrogen, and some of these compounds are possessed of medicinal powers.

It would be foreign to the object of this sketch to give the description of the individual metals : it is sufficient to have stated with regard to them these general facts. Few of them exist as ingredients in the composition of natural substances, with the exception of iron.

The class of Earths comprises a few substances, possessing certain common properties, which are the ultimate principles of the various compounds, not metallic or inflammable, which occur in the mineral kingdom. An analogy had often been observed to exist between these substances and metallic oxides, which led to the conjecture that they are of similar constitution, or consist of metallic bases combined with oxygen. Their decomposition has accordingly been effected by the application of galvan-

sm, or still more completely by the action of potassium ; they are compounds of certain bases with oxygen, and these bases possess properties, so nearly allied to those of metals, as to be sufficient perhaps to justify the placing them in that class, yet still so far different as to afford some reason for regarding them as a peculiar order.

The Primary or Simple Earths, as they are named, to distinguish them from the various earthy aggregates which exist in nature, have been described as substances insipid, insoluble in water, fixed, and nearly infusible by heat, uninflammable, and capable of combining with acids, so as to neutralize the acid properties. All these characters are not equally appropriate ; for there are several of the earths which have a pungent taste, and are soluble in water to a considerable extent, and all of them may be fused by very intense heats.

The principal earths are Silex, Argil, Magnesia, Lime, Barytes, and Strontites ; Zircon, Glucine, and Ittria, have more doubtful claims to be ranked in this class, or exist in such minute quantities, as to be comparatively unimportant.

Silex is an abundant ingredient, not only in mineral substances, but is frequently contained in vegetable products, and forms part of the earthy residuum of their decomposition. It is tasteless, nearly infusible and insoluble in water, and is peculiarly distinguished by its inertness, and comparatively limited range of combination ; among the acids it combines only with the fluoric, and even scarcely neutralizes its properties. It is dissolved by the fixed alkalis, and it unites by fusion with them, and with the other earths, and the metallic oxides.

Argil, or Alumina, is insipid, soft to the touch, infusible, insoluble in water, and particularly distinguished by forming with that fluid a ductile plastic mass, which hardens and contracts considerably when heated.—With the acids it forms compounds, which have generally a sweetish styptic taste, and which possess the property of astringency.

Magnesia exists in the form of a very light white powder, smooth and impalpable ; infusible, insoluble in water, and not forming with it a coherent paste ; it has a slightly bitter taste, changes the more delicate vegetable blue colours to a green, and combines with acids, forming compounds, in general very soluble, and having a bitter taste. In its pure form it is medicinally employed as an antacid, and its saline compounds have in general a cathartic power.

Lime, or Calcareous Earth, displays still greater energy of action. It is so far soluble in water, as to communicate to the solution a harsh styptic taste, and the power of changing the vegetable colours to a green.—Being usually obtained by the decomposition of limestone, chalk, or marble, by heat, it is in the form of a hard mass ; but when it imbibes water, either directly, or from exposure to the atmosphere, it splits, and falls down into a white powder perfectly dry. It is infusible. Combined with the acids, it neutralizes their properties. Its action is considerable on the animal system. Directly applied to animal matter, it acts chemically, producing decomposition, and thus operating as an escharotic.—Given in solution, it exerts an astringent and tonic power, which power is also displayed in several of its saline combinations ; and by its chemical agency it acts as an antacid, and, as has been supposed, likewise as a lithontriptic. Its base, Calcium, as it has been named, has been obtained, though not perhaps perfectly insulated ; it has the metallic lustre, and is highly inflammable.

Barytes surpasses lime in energy of chemical action. Like it, when in a solid mass, it absorbs water rapidly, and falls into a dry white powder; its taste is harsh and caustic; when water is combined with it, it fuses by heat comparatively moderate; but when this is dissipated, the heat requires to be raised to a much higher degree. It is more soluble in water than any of the earths, cold water dissolving a twenty-fifth of its weight, and boiling water even more than half its weight; this latter solution depositing, as it cools, transparent prismatic crystals. Its solution changes the vegetable colours to a green. This earth combines with the acids, and either from the superior strength of its attractions, or the influence of cohesion on its combination, it decomposes the greater number of the salts of the other earths, and the alkalis. It exerts affinities to the other earths, and to sulphur and phosphorus. Of all the substances of this class, it is the one which acts most powerfully on the living system; and its preparations prove poisonous to animals. From this quality, and from another, the great specific gravity of several of its saline combinations, particularly the native sulphate and carbonate, barytes was often supposed to be of a metallic nature. Its decomposition has been effected by the application of galvanism, or of potassium, and a base obtained from it, of a metallic appearance, having the colour of silver, considerably heavier than water, fusible at a heat below redness, not volatile, inflammable, and reproducing barytes when combined with oxygen.

Strontites, the last of these earths, bears a close resemblance to barytes in many of its properties. Like it, it has a pungent acrid taste, is soluble in water, crystallizable from its saturated solution by cooling, changes the vegetable colours to a green, combines with the acids, and decomposes a number of the compounds which they form with the other alkalis and earths. Its native compounds, too, have considerable specific gravity. It is, however, much less soluble in water than barytes; it requires nearly 200 parts of cold water to dissolve it; boiling water dissolves it in larger quantity. Barytes decomposes its salts. It is not poisonous, nor does it appear to exert any marked action on the living system. A characteristic property of it is that of its salts causing inflammable bodies to burn with a blood-red flame.

Following the series of substances according to their chemical relations from the metallic oxides through the earths, it is terminated by the Alkalis. These possess the chemical property most characteristic of the whole class, that of combining with acids, neutralizing the acid properties; and they form compounds, analogous in general properties to those formed by the earths and metallic oxides with the acids. But they display still more energy in their chemical actions than the earths do, and are more remote in their qualities from the oxides of the common metals. Their taste is extremely acrid; they are highly caustic; abundantly soluble in water; they change the vegetable blue and purple colours to a green, the yellow to a brown, and they combine with oils, rendering them diffusible or soluble in water. Two of the alkalis, Potassa and Soda, exist naturally in a concrete state, but they are easily fused, and at a heat not exceeding ignition are volatilized. The third, Ammonia, exists when uncombined as a permanent gas, but it is instantly condensed by water, and absorbed by it in large quantity.

The alkalis present a singular anomaly in chemical constitution. At an

early period of the researches of pneumatic chemistry, the decomposition of Ammonia was effected, and it was found to be a compound of hydrogen and nitrogen. This suggested the conjecture, that the two fixed alkalis might be of similar composition, containing at least one or other of these elements as a common principle. This conclusion from analogy has not, however, been established. Sir H. Davy, by the application of galvanic action in high intensity, succeeded in decomposing potash and soda; the bases obtained from them are substances of a metallic appearance and lustre; and these bases are combined with oxygen. The analogy of the fixed alkalis to the common metallic oxides was thus so far established, and the earths being afterwards found to be of a similar constitution, this analogy was extended to them, and all those substances, distinguished by the common property of neutralizing acids, appeared to be of similar constitution. Ammonia alone remains insulated, and it presents the singularity, that while it possesses the same general properties, and strictly resembles the other alkalis in chemical qualities, no traces of oxygen can be discovered in its composition. The analogy, therefore, either fails with regard to it, or if it be an oxidated substance, nitrogen or hydrogen must be compound, and contain oxygen as an element.

The bases of the fixed alkalis are substances of very peculiar properties. They have the lustre, opacity, and tenacity of metals; but they want the most characteristic metallic property, that of density; they are lighter even than water. They are very fusible, and pass through the changes of form, as well as different states of cohesion, within a very limited range of temperature. They are highly inflammable, they combine with oxygen with the phenomena of combustion, and are susceptible of different degrees of oxidation. These substances have been regarded as the simple bases of the alkalis; but some facts favour the opinion that they contain hydrogen, and are metallic hydrurets, instead of being simple metals.

Potash, or as it ought to be named, (in conformity to the rule of giving a similar termination to the names of substances belonging to the same order), Potassa, is obtained from the incineration of vegetables, especially the woody part; the saline matter remaining after the wood has been burnt, consists principally of this alkali, in combination with carbonic acid. It is freed from the impurities by lixiviation: the acid is abstracted by the action of lime, the alkali is obtained in solution, and, by evaporation, can be obtained in a solid state. It is of a white colour, crystallizable, fusible, and volatile at a red heat; abundantly soluble in water, soluble also in alcohol, powerfully caustic, and possessed of all the alkaline properties in a high degree. There is some uncertainty whether it exists in the vegetable matter from which it is procured in the state in which it is obtained, or whether its base is a constituent principle of that matter, and is oxygenated during the combustion: one reason for admitting the latter opinion, at least in part, is, that the alkali cannot be extracted in so large a quantity by any other process as by burning.

Potassium, as the base of potash has been named, is at the temperature of 32° a solid substance, hard and brittle, of a white colour, opaque, and with the lustre of polished silver; at 50° it becomes soft and malleable; at 70° the form of small globules; somewhat mobile and liquid; and at 100°, or according to Gay Lussac and Thenard at 136°, is completely so. It requires a temperature near to a red heat to volatilize it. It is light-

er than water, or even than alcohol or ether. It is highly inflammable when heated to its vaporific point, burning with intense heat and vivid light; at lower temperatures it combines more slowly with oxygen; and such is the strength of its affinity to this principle, that it takes it rapidly from water, and from all the acids. It is susceptible of various degrees of oxidation. In its rapid combustion it combines with the *maximum* proportion of oxygen: the oxide thus formed is not potash, but a substance of a yellow colour, containing nearly three times more oxygen than the alkali does, which is fusible, and acts with energy on inflammable and metallic substances, by imparting its excess of oxygen. The degree of oxidation which forms potash, is established almost exclusively by the agency of water; it is thus produced by decomposing water by potassium, or by adding water to the oxide at the maximum, the excess of oxygen in the latter being disengaged: the proportions in the real alkali are, according to Gay Lussac and Thenard, 83.37 of potassium, and 16.63 of oxygen. Besides these, there exists an oxide at the *minimum*, formed by the slow absorption of oxygen by potassium from atmospheric air; it is brittle and inflammable, and decomposes water, attracting a sufficient quantity of oxygen to convert it into potash.

Soda, or Mineral Alkali, as it has been denominated in contradistinction to the other alkali, which has been distinguished by the epithet of Vegetable, exists as a constituent principle of several saline mineral substances; but is usually extracted from the combustion of marine plants. It is afforded by the combustion, combined with carbonic acid, and associated with various other saline substances, and is obtained pure by the same general process as that applied to potash. Whether it pre-exists in sea plants, or whether these, in common with land vegetables, afford potash in burning, which decomposes the muriate of soda with which they are impregnated from their situation, so as to afford soda, has not been well determined. In its physical properties, this alkali bears a considerable resemblance to the other. It is solid and white, crystallizable, though with difficulty, from its watery solution; extremely acrid and caustic, fusible and volatile from heat, having a strong attraction to water, changing the vegetable colours to a green, and possessing all the alkaline properties. From potash it is principally distinguished by the different compounds it forms.

Sodium, the base of soda, is white and opaque, and has the lustre and appearance of silver; is soft and malleable; is somewhat lighter than water; it is less fusible than potassium, not losing its cohesion at a lower temperature than 120°, and requiring for its perfect fusion a heat of 180°; it is also less volatile. When heated to ignition, it burns vividly: at lower temperatures it absorbs oxygen without undergoing combustion; it abstracts oxygen from water, and from the acids, frequently with inflammation. It appears, like potassium, to be susceptible of various degrees of oxidation; that which forms the alkali is established almost exclusively by the agency of water; the proportions are 74.63 of sodium, and 25.37 of oxygen. Besides this, Gay Lussac and Thenard have shewn, that in its rapid combustion sodium combines with a quantity of oxygen one and a half greater than that which exists in soda, forming an oxide at the *maximum*, of oxidation. And there is also an oxide at the *minimum*, formed by the spontaneous absorption of oxygen by sodium at a low temperature.

Ammonia. This alkali has usually been denominated volatile, from its

volatility, even when it is combined with water, being considerable. In its insulated state it exists as a permanently elastic fluid; its odour is extremely pungent; water absorbs it in very large quantity, and this solution forms what is named Liquid Ammonia. Its tendency to assume the elastic form, and its comparative dilution, lessen the energy of its action; and hence, though possessed of the general alkaline properties, it appears weaker than the others in the affinities it exerts. Its composition was established at an early period of the researches of pneumatic chemistry, nitrogen and hydrogen appearing, both from analytic and synthetic experiments, to be its constituent principles. When the composition of the fixed alkalis was discovered, and they were proved to be oxides, analogy suggested the conjecture, that oxygen might exist in ammonia, and Davy, from some experiments, inferred this, and assigned the proportion. It has since been shewn that this is incorrect, and that ammonia, by decomposition, is resolved into hydrogen and nitrogen alone. The analogy in the chemical constitution of ammonia to that of the fixed alkalis, appeared to be established in another respect, that of its having a metallic base; Berzelius and Pontin, Swedish chemists, having found, that when the alkali is placed at the negative wire in the galvanic circuit in contact with quicksilver, the quicksilver increases in bulk, becomes thick, and at length a soft solid,—changes similar to what are produced in it by the addition of metallic matter, and which can scarcely be conceived to arise from any other cause. They concluded, therefore, that in this experiment the ammonia suffered decomposition, and its metallic base combined with the quicksilver. And they affirmed, that when the amalgam is exposed to atmospheric air or dropt into water, it absorbs oxygen, hydrogen is disengaged, denoting a decomposition of the water and a transfer of its oxygen to the metallic matter, while in both cases ammonia and quicksilver are reproduced,—results which Davy confirmed. Gay Lussac and Thenard, however, have shewn, that so far as relates to the absorption of oxygen, they are incorrect; the ammoniacal amalgam, they find, is resolved by decomposition merely into quicksilver, ammonia, and hydrogen, and they regard it therefore as a compound of these, the ammonia and hydrogen being retained by the quicksilver by a weak affinity, and in a state of slight condensation. It still appears, therefore, that ammonia is a compound of hydrogen and nitrogen, the proportions being 18.5 of hydrogen, with 81.5 of nitrogen.

The last important class of chemical agents is that of Acids. Their characteristic properties are a sour taste, the power of changing the blue, purple, and green colours of vegetables to a red, and that of combining with the alkalis, earths, and metallic oxides, forming compounds, in which, when the combination is established in the due proportion, the properties of the acid, and of the base with which it is united, are neutralized. The more powerful acids have a strong attraction to water, are intimately combined with it, and can scarcely be procured free from it; they act with energy on inflammable and metallic substances.

All the acids are compounds of oxygen, and this element is therefore regarded as the principle of acidity. This truth was established by Lavoisier, with regard to a number of the acids, and extended by analogy to a few which had not been decomposed. The only well established exception to it is that of the compound of sulphur and hydrogen, sulphuretted hydrogen, which undoubtedly possesses the general properties of an

acid, though it contain no oxygen : this leads to the conclusion that hydrogen as well as oxygen confers acidity, a conclusion confirmed by the fact that another acid, the prussic, is formed by the combination of its compound radical of carbon and nitrogen with hydrogen. And in conformity to this, there is reason to believe that all the more powerful acids—the sulphuric, muriatic, and nitric, owe their superior acidity to the joint action of these two acidifying elements,—oxygen and hydrogen. The bases of the acids are either inflammable or metallic. The production of acidity is usually the result of the full oxygenation of these, and in some cases the base combines with two proportions of oxygen, forming two acids, different in their properties from each other.

On these facts, with regard to the chemical constitution of the acids, their nomenclature is founded. The base being specific with regard to each acid, while the oxygen is common to them all, it is from the name of the former that the name of the acid is derived ; and, by a variation in the termination of this name, the different acids formed from the base, by a difference in the degrees of oxygenation, are distinguished ; the name terminating in the syllable *ic* when the acid is that which contains the larger proportion of oxygen, and in the syllable *ous* when it contains the smaller proportion. Thus sulphur forms two acids, by combining with two proportions of oxygen ; the term sulphur is the radical whence the names of these are derived, and according to the above principle, the one is denominated the sulphuric, the other the sulphurous acid. Where a large quantity of oxygen can be combined with an acid without increasing, but rather diminishing its acid powers, the name is expressed by prefixing the epithet *oxy*, as oxymuriatic acid.

Acids have an extensive power of combination. From the numerous affinities they exert, and from the facility with which they afford oxygen, they are the most active of any of the compound chemical agents, and are hence employed in many pharmaceutic operations. Those of most importance under this view are the sulphuric, nitric, and muriatic.

The Sulphuric Acid, formed from the full oxygenation of sulphur, exists combined with a portion of water equal to about 0.20, in the form of a liquid of great density. The real acid consists of 43 of sulphur and 57 of oxygen. From this state of concentration it acts powerfully, exerting strong attractions to other bodies ; and though, from the strength of affinity between its principles, it does not directly afford oxygen with facility to many substances, it enables them to attract oxygen from water, and thus subjects them to chemical change. . Many of its saline compounds are applied to medicinal use. The Sulphurous Acid is formed from the same base in a lower degree of oxygenation ; it consists of 52 of sulphur, and 58 of oxygen ; existing naturally in the elastic form, which is an obstacle to its entering into combination, and not being largely absorbed by water, so as to form a strong solution, it is much weaker in its action.

Nitric Acid is the result of the full oxygenation of nitrogen ; but in its insulated state it contains a quantity of combined water, about 0.25, which is necessary to its constitution in that state. The real acid consists of 30 of nitrogen, and 70 of oxygen. Its oxygen not being retained by a strong attraction, the acid yields it readily, and hence acts with more facility and energy on inflammable and metallic substances than any other acid.—oxidating the former, and first oxidating, then combining with the latter. In pharmacy it is used as the most general solvent of the metals. Nitrous Acid is the nitric, with an impregnation of nitric oxide gas ; it is of a yel-

low colour; and emits similar coloured dense fumes, while the other is colourless: the chemical agencies of both are nearly the same. Nitric Oxide consists of 53 of oxygen, and 47 of nitrogen; Nitrous Oxide of 37 of oxygen, and 63 of nitrogen. Both are permanent gases, and neither of them has any acidity. The former is distinguished by the great facility with which it combines with oxygen, and forms nitrous acid; the latter by its singular exciting power on the living system, when it is inspired.

Muriatic Acid exists when uncombined in the aërial form, but it is absorbed in large quantity by water, and forms a liquid acid of considerable strength. Its composition has never been discovered by direct analysis; but from the law first established by Berzelius that the quantity of oxygen in an acid is either equal to, or is a simple multiple of, the quantity of oxygen in a base which it saturates, it would be thus stated:—a hundred parts of acid saturate a certain quantity of a base, containing 29.1838 of oxygen; it therefore contains twice that quantity; and hence it is inferred that muriatic acid consists of 41.632 of radical, and 58.368 of oxygen. It appears, however, that in its gaseous form it always contains a quantity of water in intimate combination, amounting to about 0.25. This acid, not directly affording oxygen to bodies, oxidates them only by enabling them to attract oxygen from the water it contains; it thus dissolves metals; and it farther combines with other substances, as the alkalis or earths. It is capable of uniting with an additional proportion of oxygen, forming what is named Oxymuriatic Acid, which, although its acid powers are weaker, imparts oxygen more readily to bodies. And, with a still larger proportion of oxygen, it forms a third acid. Hyper-oxymuriatic-Acid, which gives to the saline compounds in which it exists, the power of acting with much energy on inflammable bodies, in consequence of the very large quantity of oxygen condensed in the combination, and not retained by any great force. An hypothesis has been suggested by Gay Lussac and Thenard, with regard to the nature of this acid, and these combinations of it with oxygen: and maintained by Davy, that oxymuriatic gas, instead of being a compound of muriatic acid and oxygen, as had been supposed, is a simple substance, and, like oxygen, an acidifying element; that this element, chlorine as it has been named, combined with hydrogen, forms muriatic acid; that muriatic acid gas contains no combined water, and that the salts named muriates are not of a saline nature, contain neither acid nor salifiable bases, but are compounds of metals, or of the metallic bases of the alkalis and earths, with chlorine. This hypothesis, when proposed, was supported by no conclusive independent evidence, but rested entirely on those facts which are explained more justly, and with more probability, from the peculiar relation of muriatic acid to that portion of combined water which in common with other acids it contains in its insulated state; and in the progress of the discussion with regard to it, the evidence in support of the common doctrine has been extended and confirmed; and its explanations shewn to be more simple and more conformable to the strictest analogies.

Other acids, less important as pharmaceutic agents, are the Carbonic, Phosphoric, Boracic, and Fluoric.

Carbonic Acid, the product of the full oxygenation of carbon, consists of 28 of carbon, and 72 of oxygen: existing in the elastic form, and being absorbed by water only in sparing quantity, it exerts no very active chemical power, but is of importance from existing in many natural

combinations, particularly of saline and earthy substances belonging to the Materia medica. The characters eminently distinguishing it are its only weakening, not entirely neutralizing the properties of the alkalis when in combination with them, and its being disengaged rapidly with effervesence by other acids from its saline compounds.

PHOSPHORIC ACID has phosphorus for its base; and the affinity between this base and the oxygen with which it is combined, being strong, it scarcely acts on bodies by oxygenating them, but simply by entering into combination with them; nor are these combinations comparatively of much importance. PHOSPHORUS ACID, in which the proportion of oxygen is smaller, is still less important.

BORACIC ACID exists in the concrete form, and its chemical action is comparatively weak. It has been decomposed by the agency of galvanism, or by potassium; the product of its decomposition is a dark olive-coloured substance. This substance, boron or boracium, is infusible, insoluble in water or in alcohol, neither does it decompose water; it attracts oxygen from other acids, and from a number of saline compounds; it burns vividly when heated in oxygen gas, and forms boracic acid; the acid, according to the estimate of Gay Lussac and Thenard, containing about one third of its weight in oxygen.

FLUORIC ACID, in the state in which, until lately, it has been known to chemists, is elastic, and is not very largely absorbed by water; its chemical action is, from these circumstances, therefore, not powerful. It unites, however, easily with the alkalis and earths, and, what peculiarly distinguishes it, is capable of dissolving siliceous earth. In the usual processes for obtaining it, it is impregnated with a portion of this earth, derived either from the materials from which it is procured, or from the glass vessels in which the process is performed; and this silex, Gay Lussac and Thenard have shewn, has a very important influence on its properties. These chemists first procured it free from this, and in a pure state. It is liquid at the temperature of 60°; but it evaporates rapidly, and forms dense vapours when exposed to the air; and the contact of silex causes it instantly to assume the gaseous form; it combines with water with a hissing noise, and the production of much heat; is possessed of high acid powers, and is peculiarly distinguished by the energy of its action on animal matter, instantly destroying it, so that a drop of it allowed to fall on the skin, erodes it with severe pain, and produces deep-seated ulceration. This acid forms, with the boracic, a compound acid, the Fluo-boric, which is also distinguished by very peculiar properties, particularly by its strong attraction to water, and by its very powerful action on vegetable and animal matter.

There is a series of acids with compound bases, derived from the vegetable and animal system; but those of them entitled to notice will be best considered with the classes of substances with which they are more strictly connected.

Tne Acids combine with the alkalis, the earths, and the metallic oxides; and when the combination is established in the due proportion, the chemical properties of the acid, and of the base of with which it is united, are mutually neutralized. Hence these compounds are named NEUTRAL SALTS, and as an order of chemical agents, they are distinguished by certain common properties. They can always be obtained in the solid state: they are generally, though not universally, soluble in water; those of them which are soluble, are capable of assuming a crytalline

form, the form being very different in different salts. Those which crystallize from their aqueous solution, always retain a quantity of water in combination, essential to the crystal, and therefore named their water of crystallization. When heated, the increase of temperature is often sufficient to enable this water to dissolve the real saline matter: this is named the watery fusion of salts; as it evaporates, the salt becomes concrete, and by a farther increase of heat, is either fused or decomposed. The term Neutral Salt is sometimes restricted to those of which the alkalis are the bases; those formed from the earths are named Earthy Salts; and those from the metallic oxides, Metallic Salts. The first term, however, is properly applied to all those compounds in which both the acid and base are neutralized. Salts are also capable of being formed either with an excess of acid, or of base, and can be obtained in many cases concrete, or even crystallized, and of definite composition; and in these compounds the ingredient in excess has usually a simple arithmetical ratio to the quantity of the same ingredient in the neutral compound, being a simple multiple of it. This is of importance in the analysis of these compounds, as facilitating the estimation of their proportions.

The nomenclature of the compound salts is through the whole series in the modern chemical language simple, and, at the same time, systematic and precise. They are formed into genera and species, according to the acids, and the bases of which they are composed; the name of the genus is derived from that of the acid, the name of the species from that of the base with which the acid is united. Thus all the salts formed from sulphuric acid are considered as constituting one genus, and are named Sulphates: and the name of each species is expressed, by adding the name of the base, as Sulphate of Soda, Sulphate of Lime, Sulphate of Iron, &c. The acid which sulphur forms in a different degree of oxygenation, the Sulphurous, forms a different order of salts; these are named Sulphites: and in like manner we have Nitrates and Nitrites, Phosphates and Phosphites, &c. Those formed from oxymuriatic acid are named Oxy-muriates. In the salts formed with an excess of acid, or with an excess of base, the acid being considered as the principle forming the genus, those compounds are distinguished by prefixing to the usual name the epithet *super*, in which the acid is predominant, and those by the epithet *sub*, in which it is deficient, or the base is in excess, as Super-sulphate of Potash, Sub-carbonate of Soda, &c. When an acid is combined in one compound with two bases, as sometimes happens, the names of both bases enter into the name of the salt, as Tartrate of Potash and Soda. Thus, by this simple system, a facility of nomenclature is afforded; the whole is uniform, and the memory is aided, by the name pointing out the nature of the salt; its adoption in Pharmacy is therefore an important improvement, compared with the arbitrary and unstable nomenclature formerly employed.

So far the chemical analysis of unorganized substances connected with the Materia Medica, has been the subject of consideration. It remains to take notice of the analysis of those belonging to the vegetable and animal kingdoms, a subject of much importance, particularly as it relates to the vegetable part of the Materia Medica, and which, from this

importance, as well as from the nature of the substances themselves, requires to be considered with more minute details.

These two classes of bodies, Organized and Unorganized, are distinguished by very obvious chemical characters. In the latter, the principles are few, and are combined generally in very simple states of union; their analysis can be executed with accuracy; the proportions of their principles can be determined with precision; and these can be again combined so as to form the decomposed substance, thus confirming the analysis by synthesis. But, with regard to the products of organization, while the composition, so far as it relates to the ultimate elements, is more uniform, it is, with regard to the modes in which they are united, much more complicated. They consist of a few common principles; but these, presented to each other in the vessels of the organic being, have been placed under circumstances infinitely varied, and which art can very imperfectly imitate. Combinations of the same elements are formed therefore, greatly diversified, and properties are derived, from differences of proportions, or modes of union extremely minute. Hence their accurate analysis is executed with difficulty,—a difficulty increased by the circumstance, that these elements having strong mutual affinities, cannot in general be obtained insulated, but when the compound is decomposed, enter into new combinations, liable to be modified by slight variations of circumstances; the proportions therefore can seldom be determined with accuracy; the modes of union in general remain unknown; and the confirmation by synthesis is entirely precluded.

Another character distinguishes these two classes. The composition of unorganized bodies being more simple, is not so liable to be subverted; their constituent principles being few, their affinities operate with more force, and the combination is more permanent. That of organized bodies being more complicated, has characters the reverse. Composed always of several elements, the affinities are more nicely adjusted, and are therefore more easily modified; and their principles having tendencies to enter into numerous forms of combination, slight variations of circumstances subvert the equilibrium. Hence the susceptibility of decomposition by which they are distinguished: they are liable even to spontaneous changes from the re-action of their elements; and when this is favoured by humidity, elevation of temperature, or the action of the air, new combinations are established, whence the original compounds are decomposed.

From the peculiar constitution of the products of organization, there are two kinds of analysis to which they are subject. The object of the one is to discover their ultimate composition; that of the other is less refined, being confined to the investigation of the proximate principles of which they are composed.

It is seldom that a vegetable substance is homogeneous. The seed, for example, the bark, or the leaves of a plant, is not of one uniform composition, but consists of various proximate principles in a state of mixture, or of slight combination, and capable of being easily separated from each other. Now, these are often connected with their medicinal virtues; the virtue residing perhaps not in the entire substance of the leaf, bark, or seed, but in a principle capable of being separated, and which may frequently be employed with advantage in its insulated state.

Hence the importance of the analysis of the vegetable substances belonging to the Materia Medica, so far as relates to their proximate principles; the knowledge it conveys enabling us to employ them with more discrimination, and to submit them to the proper pharmaceutic treatment. An enumeration of their proximate principles, and more particularly of those on which their medicinal powers depend, accordingly always enters into their description as articles of the Materia Medica.

This analysis is executed in various modes, adapted to particular cases, according to the principles which form the vegetable substance.

Sometimes it is effected merely by heat. The temperature cannot indeed be elevated very high, as then the proximate principles of the vegetable would be themselves decomposed, and their elements brought into new combinations. But at a heat comparatively moderate, as that of boiling water, this does not happen; and at this temperature several of these principles, such as essential oil, camphor, and some others not very well defined, are volatilized without decomposition, and of course can be obtained pure.

The action of different solvents is of more extensive use in conducting the vegetable analysis. Water dissolves several of their component principles, such as gum and extractive matter, tannin, saline substances, and some others. These are dissolved in greater or less quantity, and in more or less purity, according to the temperature of the water employed. In general, by raising the water to its boiling point, it is able to dissolve them more completely; but some of them are apt to be volatilized, and others altered in composition, especially if the atmospheric air is not excluded. Of the substances which the water holds dissolved, part are separated as it cools; the gum can be precipitated by alcohol; the saline substances may be crystallized, or can be discovered by evaporating the solution to dryness, and exposing the mass to such a heat as will destroy the inflammable parts; tannin and some others are detected by their chemical tests.

Alcohol is another agent of much importance in executing the vegetable analysis. It dissolves the resin, balsam, camphor, and essential oil: these solutions are decomposed by water, each substance being separated, and discernible by its peculiar qualities. Equal parts of alcohol and water, or proof spirit as it is named, is also often employed as a solvent in the analysis of vegetables. Ether dissolves nearly the same principles as alcohol. And the acids, alkalis, and soluble earths, are sometimes of utility as re-agents, in pointing out the existence of peculiar principles.

Lastly, in the analysis of vegetables, we are often able to procure several of their proximate principles, by mechanical means, particularly by expression. Sometimes, too, they exude spontaneously from the growing vegetable, or are obtained from incisions made in the branches or trunk.

After we have discovered the proximate principles of a plant, or of any part of it, the next step is to ascertain their composition. This is an investigation attended, however, with much difficulty, as being liable to all the errors arising from a complicated analysis, and incapable of being confirmed by the surer test which synthesis affords.

The composition of these substances with respect to their ultimate principles is nearly uniform. All of them contain carbon and hydrogen, generally if not invariably united with oxygen; some farther contain

nitrogen and phosphorus; and in others several of the metals, particularly iron and maganese, exist. Lime, too, and the two fixed alkalis, either pure or more commonly in combination with some of the acids, are not unfrequently constituents of vegetable matter. These latter substances, however, are seldom in any considerable proportion; nor in general do they appear to modify much the properties of the substances in which they exist. Nitrogen, and perhaps lime, when present, appear to have the most important influence, and with the exception of the few compounds of which they form a part, it may be said, that the vegetable proximate principles consist of carbon, hydrogen, and oxygen: the differences in their properties being produced by differences in the proportions of these principles, and of the modes in which they are combined.

That a difference in the proportions of these elements may give rise to the differences in the properties of the compounds which they form, cannot be doubted; since in many other cases of chemical combinations, where there is no difficulty in the analysis, differences equally important and well marked are produced by this cause. In vegetable substances we accordingly can often trace this as the cause, without being able to point out any other. Thus, fixed and volatile oils have properties in many respects dissimilar; by analysis both are found to consist of carbon and hydrogen, united in different proportions, the volatile oils having more hydrogen in proportion to the carbon than the fixed have; this is a cause sufficient to account for the differences in their properties; and it accords sufficiently with that difference, for hydrogen being a substance of great rarity and volatility, those compounds in which it predominates, as ether, alcohol, and others, are in general light and volatile. The greater volatility, therefore, of the essential, compared with the fixed oils, may be ascribed to its predominance.

In other cases, it is probable that the mode in which the constituent principles of these substances are united, is the cause of the difference in their qualities. This, indeed, can be but imperfectly investigated, either by analysis or synthesis; but it is conceivable, *a priori*, and sufficiently confirmed by chemical facts, that a difference in the mode of union may give rise to very important diversities of properties. If a compound, for example, consists of three elements, these may be united in two modes. Their attractions may be reciprocally balanced, and they may form what is named, in strict propriety, a ternary combination; or, from a variation in the circumstances under which the union has been effected, or a difference in the strength of their attractive powers, two of them may be combined, and the compound thus formed may exert an attraction to the third principle, unite with it, and form a new substance. The compounds resulting from these different modes of combination, though composed of the same principles, united perhaps even in the same proportions, would still have properties different from each other. Still greater diversities will be produced where the elements are more numerous, and the possible modes of union are of course more diversified. And when we consider these causes from difference of proportions, and modes of combination, we shall scarcely be surprised at the number of different substances, immense as it is, which nature forms from a few elementary principles.

The proximate principles of vegetables are sometimes analysed by ex-

posure to heat; their elements enter into new combinations, and, from the nature of the products, we discover what the principles were. Thus, if the substance exposed to heat yields a large quantity of acid, we conclude that it contains a considerable proportion of oxygen. If it afford much empyreumatic oil, we infer that it contains a large quantity of hydrogen, this principle being necessary to the constitution of that product. When ammonia or prussic acid is afforded by this kind of analysis, we conclude, for the same reason, that nitrogen has been a constituent element. And by the same mode are discovered the earths and metals which had been present in it; these remaining after the volatile parts have been expelled. Lastly, from the quantity of charcoal which remains as a residuum, we can form some conclusion as to the quantity of carbon which the vegetable substance contained.

Their analysis is also effected by exposing them to heat with the access of atmospheric air, and collecting the products of the combustion that takes place. From the nature of these products, we can ascertain the proportions in which they were united. Oil, for example, when subjected to this analysis, yields nothing but carbonic acid and water. We conclude therefore that it is composed of carbon and hydrogen, since these principles, united with oxygen, form these products, and since, if any other simple substance had existed in the oil, it would have appeared either pure or in combination with oxygen. We can even determine in this manner the proportion in which the carbon and hydrogen existed in the combination. From knowing what quantity of carbon exists in a given quantity of carbonic acid, and what quantity of hydrogen exists in a given quantity of water, we thus also discover whether any oxygen had existed in the composition of the oil.

Their analysis is also sometimes executed by the agency of the nitric acid, which communicates to them oxygen, and by the product ascertains the nature of their acidifiable base.

This mode of analysis by oxygenation, has lately been rendered more exact in the execution by a variation introduced by Gay Lussac,—that of employing hyper-oxymuriate of potash as the oxygenating substance; a certain weight of this salt being heated with a portion of the vegetable matter in its dryest state; and the products formed by the combination of the oxygen of the salt with the elements of the vegetable substance being collected. His experiments establish some very important general results. In one class of vegetable products, those which are of the nature of gum or fecula, the oxygen and hydrogen they contain are in that proportion to each other which forms water, there being added to this a certain quantity of carbon. In another class, those which are acid, the oxygen is to the hydrogen in a larger proportion than that which forms water. And in a third class, composed of those which are oily or inflammable, the hydrogen is in larger proportion. The following table presents these results, and the proportions of the elements of some of the most important vegetable proximate principles, as assigned by this method.

Substances analysed	Carbon contained in that Substance.	Oxygen contained in that Substance.	Hydrogen contained in that substance.	Supposing the oxygen and hydrogen in the state of water in the substance.		
				Carbon.	Water.	Oxygen in excess.
Sugar - - - - - - -	42.47	50.63	6.90	42.47	57.53	0
Gum-arabic - - - -	42.23	50.84	6.93	42.23	57.77	0
Fecula - - - - - -	43.55	49 68	6.77	43.55	56.45	0
Sugar of milk - - -	38.825	53.834	7.341	38.825	61.175	0
Oak-wood - - - -	52.53	41.78	5.69	52.53	47.47	0
Beech-wood - - -	51.45	42.73	5.82	51.45	48.55	0
Mucous acid - - -	33.69	62.67	3.62	33.69	30.16	36.15
Oxalic acid - - - -	26.57	70.69	2.74	26.57	22.87	50.56
Tartaric acid - - -	24.05	69.32	6.63	24.05	55.24	20.71
Citric acid - - - -	33.81	59.86	6.33	33.81	52.75	13.44
Acetic acid - - - -	50.22	44.15	5.63	50.22	46.91	2.87
						Hydrogen in exces
Resin, common - -	75.94	13.34	10.72	75 94	15.16	8.90
Copal - - - - - -	76.81	10.61	12.58	76.81	12.05	11.14
Wax - - - - - - -	81.79	5.54	12.67	81.79	6.30	11.91
Olive oil - - - - -	77.21	9.43	13.36	77.21	10.71	12.08

The ultimate analysis of the vegetable substances belonging to the Materia Medica is seldom of utility, since we can scarcely ever discover any relation between the composition and the medicinal powers of the substance analysed. These, in common with all its properties, no doubt depend on that composition ; but our modes of analysis are still too limited and imperfect to admit of our tracing the connexion between them. The application of chemistry, therefore, to the vegetable substances belonging to the Materia Medica, is in a great measure confined to the discrimination of their proximate principles.

The Proximate Principles of vegetables are numerous, and of very different kinds. They are not all to be met with in every vegetable, or in every period of vegetation ; some exist only in certain plants, and that only in their state of vigour and maturity : at other times they are to be found only before they have arrived at that period ; some are deposited in particular organs, others are diffused through the whole substance of the vegetable, and mixed more or less intimately with all its parts : and some are nearly peculiar to certain vegetables, while others are common to almost every plant. Those only require to be pointed out in this sketch, which are connected with medicinal properties.

These principles are the products of vegetation from a common juice or sap, which circulates freely through every part of the vegetable system, being supplied by absorption from the soil, and perhaps from the atmosphere. It varies in its qualities, particularly according to the season, and the progress of the plant to maturity : frequently too it has an intermixture of the proper juices : it always contains the usual elements of vegetable matter, with generally saline substances, having principally lime for their base. By the chemical changes it suffers from the action

of the vessels of the plant, aided by the action of the air and of light, its elements pass into various states of combinations, whence the peculiar products of vegetation are formed.

The first transition of the sap appears to be into Mucilage, or Gum, one of the proximate principles contained in greatest abundance in vegetables. Gum is the name given to this principle when it is obtained in a concrete state ; Mucilage is the name given to it when it is expressed in a liquid state, or extracted by maceration in water. Between these there exist some differences in their relation to re-agents, whence a distinction has been established between them ; but their general properties are the same, and similar differences exist between different varieties of gum itself.

This principle is found in all young plants, in greater or less quantity ; and is often so abundant in the plant, as to be discharged by spontaneous exudation. It abounds also in their roots, stalks, and leaves, and especially in their seeds. It is an inodorous, insipid, and glutinous substance, soluble in water in every proportion, and forming with it a thick viscid solution, which, by evaporation affords a tenacious mass, that when dried is brittle, and again soluble. It is insoluble in alcohol, ether, or oil, and is precipitated from its solution in water by the addition of alcohol. It does not absorb oxygen from the atmosphere ; though its solution becomes sensibly acid by keeping, owing to partial spontaneous decomposition, and the combination of part of the principles of the gum, so as to form acetic acid ; nor does it act upon the metals, but it combines with several of the metallic oxides. Exposed to heat it is neither fusible nor volatile. At a temperature superior to 212, but inferior to that of ignition, it is decomposed ; its principles entering into new combinations ; the products are an acid liquor, consisting principally of acetic acid, carbonic acid, and carburetted hydrogen gases, with a little ammonia, and a residuum of charcoal containing lime, one ounce of gum, affording 6 grains of lime. This lime is also detected by adding sulphuric acid to a solution of gum. From these products of the analysis, it is evident that the ultimate principles of gum are, oxygen, hydrogen, and carbon, with smaller proportions of nitrogen and lime. Berzelius states the proportions as follows :—oxygen 51.456, carbon 41.752, hydrogen 6.792.=100. Gum is not capable of passing into the vinous fermentation, which appears to be owing to the portion of lime existing in it, as lime has the effect of preventing even sugar from suffering this change.

Gum is not inflammable ; for although, when heated in contact with atmospheric air, it combines with oxygen, it emits no flame. The principal products of this combination are carbonic acid and water. By the action of nitric acid it is converted into oxalic, malic, and saccholactic acids.

Gum is usually obtained either by spontaneous exudation, or by incisions made in the trunks and branches of trees. It is more or less pure as it is obtained from different plants. Its existence in vegetables is detected by boiling gently the vegetable substance with water ; the water dissolves the gum, and if much of that principle be present, the solution is glutinous. It may be allowed to remain till the impurities have subsided ; if it then be evaporated to the consistence of thin syrup, the addition of three parts of alcohol will separate the whole of the gum in flakes.

Pure gum is not an active substance, considered with respect to its effect on the living system. In medicine it is only used for its lubricating quality ; and so little activity does it exert, that it has often been taken for a considerable time as an article of food. From its chemical properties, it is of rather more importance. As a component part of vegetable matter, it renders the other parts more soluble in watery liquors, and may thus favour their action on the stomach. In Pharmacy, it is used as a medium to combine balsams, resins, and oils with water. If a small quantity of any of these substances be triturated with a little gum or mucilage, on the addition of water they remain suspended in it, forming a white milky-like mixture, retaining all the properties of the balsam or oil. Though pure gum is thus inactive, yet the virtues of many vegetables depend on a gummy or mucilaginous matter.

Fecula is a principle approaching in several of its characters to gum. Like it, it is soluble in hot water, and forms a viscid glutinous solution ; but it is at once distinguished by being perfectly insoluble in cold water. It exists principally in the tuberose roots and gramineous seeds. It is extracted by beating the dried root or seed with a large quantity of water : the liquid soon becomes milky, from the diffusion of a white powder through it. On being poured from the remaining vegetable matter, and allowed to remain at rest, this powder is deposited, and when washed and dried, is the fecula of the plant. It is generally mild and insipid, of a white colour, with a peculiar kind of brilliancy, soft to the touch ; but portions of the other principles of the plant sometimes adhere to it, from which it receives colour, smell, and taste. Starch is the fecula of wheat, and is the most abundant part of that grain.

Fecula is insoluble in alcohol. The action of the acids, on it, is somewhat analogous to that they exert on gum, dissolving it when they are weak or diluted, but decomposing it when they are more concentrated. The alkalis, also dissolve it. Exposed to heat, it is charred, and suffers decomposition, affording products which indicate carbon, hydrogen, and oxygen, to be its constituent principles. A property eminently characteristic of it, and probably depending on its composition, is that of being convertible into saccharine matter, and thence ultimately passing into the vinous fermentation,—a property not belonging to gum or any other principle. This conversion takes place in germination, and is accompanied with an absorption of oxygen, and formation of carbonic acid. Lignin, however; according to the experiments of M. Braconnot, affords a gum which is converted into two new principles by the action of dilute nitric acid, sugar, and an acid which he calls vegeto-sulphuric acid.

The component parts of fecula are stated as follows by Berzelius : carbon, 43.481, oxygen 48.455, hydrogen 7.064.=100. Proust mentions a principle of barley called Hordein, but it appears rather to be a variety of starch than a distinct vegetable principle.

Fecula is a substance highly nutritive, and is usually contained in those plants which serve as food. It is sometimes employed in its pure state in medicine, on account of its nutritive quality, and from being easy of digestion ; sago and salop are substances of this kind.

Gluten This principle is usually associated with fecula, and is obtained in the process in which the fecula is separated. It then appears as a viscous, elastic, and fibrous-like substance, which, from its resemblance to the animal product named Gluten, has been denominated Vegetable

Gluten. It is obtained from the flower of wheat in greatest abundance; the flower is made into a paste with water, which being compressed by the hand, while a stream of water falls upon it, the fecula is carried off in the state of powder: the mucilaginous and saccharine parts of the grain are dissolved by the water, and there remains a tenacious ductile mass, forming the gluten; it has scarcely any taste, is of a greyish colour, and when dryed is semi-transparent: it is insoluble in water, and is dissolved in very small quantity by alcohol: it is dissolved by acetic acid; by the action of nitrous acid, it is converted into oxalic acid, giving out, at the same time, nitrogen gas: decomposed by heat, it affords a large quantity of ammonia, and it is subject like animal matter to putrefaction. It contains a larger proportion of nitrogen than any other vegetable product does, and it is supposed to render those vegetables in which it is present highly nutritive.

It has lately been discovered by M. Taddey, that gluten may be separated into two distinct principles, one of which, Gliadine, is procured by successively dissolving the gluten in alcohol; the solution gradually deposits a whitish matter, and on evaporation, a yellowish-coloured substance, or a sweet balsamic taste, is obtained. The other principle is the gluten which remains undissolved by the alcohol; he calls it Zimoma. Gliadine is in some respects similar to the resins, but differs from them in being insoluble in sulphuric ether. It is pretty soluble in alcohol, and is scarcely affected by the mineral or vegetable acids; it also of itself undergoes slow fermentation, and causes the same process in saccharine substances. Zimoma presents the appearance of a hard, tough, shapeless mass, of an ash-white colour; its specific gravity is greater than that of water, and during fermentation it exhales a fœtid urinous odour. The mineral acids and vinegar dissolve it completely at a boiling temperature.

Another principle which has been supposed to exist in vegetables, is that which has been named Albumen, from its resemblance to the animal principle of that name. It is soluble in cold water, its solution being coagulated also by heat; it is coagulated also by alcohol, but is dissolved by the alkalis; like gluten, it is liable to putrefaction, and furnishes a large quantity of ammonia by distillation. This principle is found in hemlock, scurvy grass, cresses, and several other plants, and is obtained from the fresh expressed juice of the leaves when they are heated nearly to the boiling point; the albuminous matter coagulating, and separating in the form of flakes. A similar separation takes place on the addition of spirit of wine. It is contained also in the seeds of other plants, particularly in the different nutritive grains; in the farina of wheat, for instance, it is found dissolved in the water which is employed in separating the fecula from the gluten. This principle, has, however, been regarded, and perhaps justly, as a variety of gluten; it differs little from it in chemical properties; and the peculiar physical qualities supposed to be distinctive of gluten are obviously derived from the process by which it is obtained.

Saccharine Matter. This exists in many vegetable substances, especially in their fruits and roots, but often intimately united with their mucilaginous and extractive matter. When freed from these, its taste is sweet, without any peculiar flavour; it is soluble in water and in alcohol; is capable of crystallizing; its watery solution enters first into the vinous, and then into the acetous fermentation. By the action of nitric

acid, it is converted into oxalic acid; decomposed by heat, it affords a large quantity of empyreumatic oil, carbonic acid, and carburetted hydrogen gases, the residuum being charcoal. It consists, therefore, of carbon, hydrogen, and oxygen; and from the large quantity of acid which its analysis yields, it appears to contain more oxygen than any other vegetable substance that is not acid.

Sugar appears to be often formed from the fecula of the vegetable in which it exists. It contains nearly the same principles as fecula does, and the operation of malting throws considerable light on its formation; in this process the fecula of grain is converted into saccharine matter; oxygen is absorbed, and carbonic acid formed: and this abstraction of carbon, if it constitutes the whole change, of course proves that the sugar, which is the product of the operation, has an increased proportion of hydrogen and oxygen. In other cases, as in the maturation of fruit, sugar appears to be formed from the acid juice of the fruit, and this is probably effected by the abstraction of oxygen. Saccharine matter has little activity, though there are some varieties of it, in which some weak medicinal powers reside.

Oil is a common proximate principle of vegetable matter; it is of two kinds, expressed or fat oil, and distilled, volatile or essential oil. These have the common qualities of unctuosity and inflammability; but they also possess peculiar properties, by which they are distinguished as species.

The expressed, fat, or fixed oils, are thick and unctuous, insipid and inodorous; they congeal on exposure to cold, are lighter than water, and insoluble in that liquid; they are likewise insoluble, except in minute quantity, in alcohol, and they combine with the alkalis, forming soap. They are not volatilized at the temperature of 212°: some require to be raised to 600° to make them boil, and the condensed oil is changed in its properties. At a temperature somewhat higher, they are decomposed in close vessels, and burn when the atmospheric air is admitted. They also slowly absorb oxygen at a low temperature; a small quantity of acid is formed, which renders them rancid; by longer exposure to the air they are inspissated, and become at length concrete: at least those oils which have been expressed with the aid of heat, and which are named drying oils, suffer this last change, and are ultimately converted into a resinous matter.

Expressed oils consist chiefly of carbon and hydrogen, as is established by the products of their decomposition by heat, which are chiefly carburetted hydrogen and carbonic acid. The products of their combustion are water and carbonic acid.

These oils are contained in the seeds and fruit of vegetables, and only at the period of their maturity. They are extracted by expression, or by decoction with water; they are frequently impregnated with part of the extractive, mucilaginous, or resinous particles, which the seed or fruit contains; from which they derive colour, and in many cases a peculiar taste and odour, and even perhaps certain medicinal powers. In general, however, they have little activity as medicines. They are mild and emollient, and are used principally for these virtues. They are rendered miscible with water by the medium of gum or sugar, or by the addition of a small quantity of any of the alkalis.

Volatile or Essential oils have characteristic properties different from

those of expressed oils. They are volatile at a low temperature, and are entirely and quickly converted into vapour at the heat of boiling water, without being decomposed; they are soluble in a small proportion in water, and hence the taste and flavour which water receives from many vegetables by distillation. In alcohol they are completely soluble; but they do not combine with the alkalis with facility; they are in general odoriferous, pungent, and even acrid; they are more highly inflammable than the fixed oils, and by exposure to the atmosphere they slowly absorb oxygen, are thickened and coloured, lose much of their smell and pungency, and are at length converted into substances of a resinous nature. This change is partly owing to the volatilization of the oil, but principally to the oxygen absorbed combining with a portion of their hydrogen.

These oils, from their analysis by heat, or by combustion, appear to consist principally of carbon and hydrogen. They differ from the fixed oils in containing a larger proportion of hydrogen; hence they are more volatile, and more inflammable, and by combustion afford a larger quantity of aqueous vapour.

Volatile oils are less abundant in the products of vegetation than some other principles; they do not exist indeed in any considerable quantity but in the aromatic plants; in some plants, the oil is confined to the flowers, fruit, leaves, or bark; sometimes it is contained in several of these parts, and in a few instances it is found diffused through every part. The quantity varies not only according to the age, but also according to the vigour of the plant; hence it is much influenced by climate, soil, and season. It is remarkable, that some of the most odoriferous flowers, as the rose or jessamine, yield scarcely any essential oil, though they lose their flavour by a gentle heat.

Some of these oils being contained in distinct vesicles, may be obtained by pressure. In this manner essential oils can be obtained from orange or lemon rhind. More usually they are procured by distillation; the vegetable is boiled in water; the essential oil is volatilized with the aqueous vapour; both are condensed in close vessels; the water has the taste and flavour of the plant, from having dissolved a small part of the oil: the greater part, however, is collected pure, either swimming on the surface of the water, when the oil is lighter, as is generally the case, or in a few cases, when it is heavier, having fallen to the bottom.

The essential oils of vegetables are not without some degree of medicinal activity. They have the odour, and generally the taste of the vegetable from which they are obtained, accompanied with more or less pungency. Some of them, however, are less pungent and less acrid than the vegetable matter from which they are procured, these qualities residing in the resin, or some other proximate principle.

A proximate principle found in some vegetables, similar in many of its properties to essential oil, is CAMPHOR. It is a solid substance of a white colour, semi-transparent, having a strong peculiar smell, and a penetrating taste; tenacious, and slightly unctuous to the touch. It is very sparingly soluble in water, but is abundantly soluble in alcohol, ether, and oils; from these solutions it is precipitated by the addition of water. It evaporates entirely, though slowly, at the common temperature of the atmosphere; at a higher temperature, in close vessels, it is sublimed without alteration; it is also highly inflammable, the products of the combustion being carbonic acid, and what is named camphoric acid. It

is acted on by the more powerful acids, sulphuric acid charring it and forming a portion of tannin ; nitric acid dissolving it, and decomposing a portion of it, converting it into an acid ; muriatic, fluoric, acetic, and carbonic acid dissolving it, without materially changing its composition, as the greater part can be precipitated by water. Nitric acid repeatedly distilled from it, converts it into a concrete acid named camphoric acid, which appears to be different from any known acid, though it approaches in many of its properties to the benzoic.

By peculiar arrangements, which impede its volatilization, camphor may be decomposed by heat. This is effected by mixing it intimately with six parts of pure clay, making the mixture into balls by the addition of water, and when these are dry, subjecting them to a strong heat, suddenly raised. A volatile oil, fragrant, and pungent, of a golden yellow colour, amounting to one-third of the weight of the camphor, distils over ; a quantity of charcoal, about $\frac{1}{4}$th of the weight of the camphor, remains ; the remaining products of the decomposition are carburetted hydrogen, carbonic acid gas, and camphoric acid. From the result of this analysis, camphor appears to differ from the essential oils, principally in containing a much larger proportion of carbon, since, by its decomposition by heat, it is resolved principally into charcoal, or compounds of carbon, and into an oil which has all the properties of an essential oil, being odorous and pungent, volatile and inflammable, soluble in alcohol, and precipitated from it by the addition of water.

Camphor is found in distinct vesicles, in the wood and bark of certain vegetables. It is also contained in many essential oils, as those of lavender, sage, and others, from which it is deposited on long keeping. A substance analogous to it in many of its properties, is capable of being artificially formed, by the action of muriatic acid on oil of turpentine.

The same relation which camphor bears to the volatile, Wax seems to have to the fixed oils. This substance, though formed by the bee, is also a product of vegetation ; it is yielded by the leaves and fruit, and it is sometimes intimately mixed with the resin, gum or extractive matter of plants. It is insoluble in water, and is soluble in very small quantity with the aid of heat in alcohol. It combines with the fixed alkalis, though with some difficulty. It unites easily with the expressed oils. It melts at a moderate heat. By distillation in close vessels it affords an acid, and a thick oil, a small quantity of charcoal being the residuum.

Resin. This principle is in some measure connected with essential oil, and in plants is often united with it, as well as with other principles. Some vegetables, however, exude juices which concrete into a matter entirely resinous, and it is from these that the characters of the substances belonging to this genus are taken. The distinguishing properties of a resin are its existing in a solid state, being insoluble in water, but soluble in alcohol, ether, and oils ; the solution in ether or alcohol is decomposed by water : resins are in general odorous and sapid, though neither of these qualities is essential to a pure resin ; they are inflammable, and burn with much smoke ; at a temperature nearly that of boiling water, they melt, but they cannot be volatilized without being decomposed. In close vessels the products of their decomposition by heat are water, empyreumatic acetic acid, an empyreumatic oil, and a residuum of charcoal, indicating carbon, hydrogen, and oxygen to be their ultimate principles. At the common temperature of the atmosphere, they do not com-

bine with oxygen; neither are they acted on by water; the solutions of them in alcohol are therefore employed under the form of varnishes, to preserve other bodies from alteration by exposure to the air. They are dissolved by the fixed alkalis; likewise by some of the acids, especially the acetic: the stronger acids decompose them.

The existence of resin in a vegetable is discovered by infusing it in alcohol; this dissolves it if any is present, and it can then be precipitated from the solution by the addition of water. The method of estimating the quantity is by ascertaining the increase of weight which alcohol acquires from it by digestion, or the alcohol may be evaporated by a moderate heat, and the resin obtained pure.

Resins are in general more active than gums, with respect to their medicinal powers. The purest resins are indeed nearly inert, but there are many vegetable substances which act powerfully on the system, that appear to consist principally of resinous matter, and it is in this resinous part that their powers reside. The proper solvent or menstruum of resin is alcohol; by this it can be extracted from some of the other constituent parts of vegetables; there are others, however, which are soluble in the same fluid, and therefore it is difficult to obtain the resin pure. Though resin is insoluble by itself in water, yet part of it can be taken up, and kept suspended by the medium of gum.

These two principles, Gum and Resin, are often naturally mixed in vegetables, at least what are named Gum Resins, which form some of the most active articles of the Materia Medica, are considered as natural compositions of this kind. Their chemical properties are derived from the two principles of which they consist: thus, they are only partially soluble either in water or in alcohol; they are soluble in alkaline liquors: they are not fusible by heat, they only soften, and if the heat is raised higher, are decomposed, affording a little ammonia with the usual products, probably derived from the gum they contain. The proportions of gum and resin, thus mixed, are in different substances of this family very various: it is not even always practicable to separate them into distinct portions of these two principles; resinous matter generally predominates; but the whole composition is usually such, that a mixture of equal parts of water and alcohol dissolves it. This solvent also dissolves some other vegetable principles, particularly extract, and hence it is the menstruum most generally used in Pharmacy to extract the active matter of vegetables.

Balsams are resinous juices, with an intermixture generally of essential oil, and containing always a portion of the acid named Benzoic acid. They are usually thick and tenacious, becoming by age concrete. They are odorous and pungent, principally from the essential oil they contain.

A principle of considerable importance in its pharmaceutic relations, which is supposed to constitute the active matter of many vegetables, is what has been named by the French chemists, by whom its characters were first established, Extract, or Extractive Matter. The soluble matter of saffron affords one of the best examples of it. Its leading character is, that it is soluble equally in pure water and in alcohol; and hence a solution of it in the one fluid is not precipitated by the addition of the other. By this property it is distinguished both from gum and resin, the one being insoluble in water, the other in alcohol. The compound of the two, or gum-resin, is indeed partly soluble in either of these fluids,

but it never is completely so, since, if it is entirely soluble in water, it is only partially dissolved by alcohol ; and if it be completely dissolved by alcohol, it is imperfectly dissolved by water. If a gum-resin be digested with alcohol, the tincture it affords is decomposed by water, and, *vice versa*, its watery solution is decomposed by alcohol.

There is another character by which extractive matter is distinguished, that of suffering decomposition when exposed in a humid state to the atmospheric air ; this takes place even at natural temperatures, and with more rapidity when the temperature is raised, as when the extractive matter is boiled in water : it then becomes insoluble and comparatively inert. This change Fourcroy ascribed to the fixation of oxygen. According to T. Saussure, oxygen is indeed absorbed, but carbonic acid is at the same time formed ; he supposes, too, that part of the oxygen and hydrogen of the extractive matter, combine and form water, and that the inert insoluble precipitate has therefore an increased proportion of carbon. It is from this cause apparently that the medicinal powers of many vegetables are injured by decoction in water with the admission of air, and not, as was at one time believed, from the dissipation of any volatile active principles ; many plants, indeed, which sustain injury from this operation, containing no such principles.

By oxymuriatic acid, extract is converted into a concrete substance of a yellow colour, insoluble in water. It exerts affinities to argil and to metallic oxides, and is hence acted on by a number of metallic salts. Muriate of tin, at the maximum of oxidation, precipitates it copiously, and forms therefore a delicate test of it, which is liable however to the fallacy that it precipitates some other vegetable principles. By heat it is decomposed, affording empyreumatic oil and acid, with a portion of ammonia ; and in this, as well as in its spontaneous decomposition, when the re-action of its elements is favoured by humidity, it leaves as a residuum carbonates of potash and lime.

This principle is supposed to be the base of what are named the Extracts of Plants ;—preparations formed by boiling vegetables in water, and evaporating the clear liquor to a thick consistence. As procured in this way, it must have an intermixture, greater or less, of those principles which are soluble in water ; and from being so liable to decomposition, it must be injured during the evaporation. It is the basis, too, though in a similar state of intermixture and partial decomposition, of what are named the inspissated juices of plants. It exists in the seeds, leaves, bark, and wood.

Though the characters of this principle appear to be distinctive, there is still some ambiguity with regard to it, particularly from the circumstance, that these characters are not uniform ; a principle existing in some vegetables which has some of these distinctive properties, without the others ; as, for example, in Peruvian bark, the active matter of which is rendered inert and insoluble by decoction in water, and so far has one of the peculiar properties of extract ; while it has not the other, that of equal solubility in alcohol and water, but is more soluble in the former than in the latter. Nor is there any certainty that this extractive matter has been obtained pure and insulated ; and it is therefore possible that it may consist of some of the other principles in a state of mixture, their properties being modified by their reciprocal action.

Tannin. The important medicinal property of astringency, appear-

ed from some chemical facts to be dependent in vegetable substances on a peculiar principle, as it is discoverable in them by a chemical test, that of striking a deep purple colour with the salts of iron. This effect is exhibited by all the vegetable astringents, and in a degree nearly proportional to their astringency. A peculiar acid having been discovered to exist in these astringents, afterwards named Gallic Acid, it was supposed to be the principle on which this property depends. But subsequent experiments have proved that the astringency resides in a principle of a different nature, which, from being the agent concerned in the operation of tanning, has obtained the name of Tan or Tannin.

This principle exists in all the powerful vegetable astringents; it is extracted by maceration with water, and is detected in the infusion by a peculiar test, that of the animal principle denominated Gelatin. If a solution of gelatin is added to the infusion, it becomes turbid, and a precipitate is thrown down, composed of the tannin and gelatin in combination. We have no perfect process for obtaining tannin in an insulated state; the most simple is precipitating it from the infusion of a vegetable astringent by lime-water, and afterwards submitting the compound of lime and tannin, which is formed, to the action of dilute muriatic acid, which abstracts the lime, and leaves the tannin.

Tannin, evaporated from its solution, is loose and friable, of a brown colour, has a resinous fracture, a peculiar odour, and a taste rough and bitter. It is soluble in water, either cold or warm, and in alcohol when not very highly rectified. It appears to suffer decomposition from exposure to the air in a humid state. By the acids, it is precipitated from its watery solution, and by some of them is decomposed. It unites with the alkalis, forming soluble compounds; with the earths it forms compounds of sparing solubility; it exerts affinities to the metallic oxides, and it is principally from its action that infusions of vegetable astringents produce dark-coloured precipitates with metallic salts. Exposed to heat, it affords an acid liquid, an oil, and a considerable quantity of carbonic acid, leaving a spongy charcoal.

Its action on animal gelatin is its most important property in relation to the object of the present outline, as on this probably depends its astringent power; it combines with gelatin forming an insoluble precipitate, whence it corrugates and renders more dense the animal fibre of which this principle constitutes a chief part. It exists in all the powerful vegetable astringents, mixed with extractive matter, mucilage, gallic acid, and other principles. A product very analogous to it is also capable of being artificially formed, principally by the action of sulphuric and nitric acids on vegetable substances which abound in carbonaceous matter.

Vegetable Acids. The acid found in the juice and other parts of plants, is not always the same. Not less than seven acids, different from each other, are of vegetable origin,—the Gallic, Oxalic, Malic, Citric, Tartaric, Benzoic, and Acetic. To these may be added the Prussic; for though it is more peculiarly formed from animal matter, it also exists in the vegetable kingdom.

Gallic Acid. The existence of this acid in some of the more powerful astringents, particularly in the gall-nut, can be discovered by their watery infusion reddening the infusion of litmus. If the concentrated infusion be left exposed to the air for some months, this acid is deposited

in the state of a crystalline deposite, mixed with mucous flakes, from which it may be purified. It may also be obtained by sublimation from the gall-nut, or even by distillation with water, though it is doubtful whether, as procured by these or other processes, it is altogether free from tannin; that by sublimation appears to be most so. By crystallization it is obtained in slender prisms of a white colour; its taste is sour, and it reddens the vegetable colours; it is soluble in 14 parts of cold, and in less than 2 parts of boiling water; it is also soluble in alcohol. It suffers decomposition from heat, and the process indicates a large quantity of carbon in its composition. It combines with the alkalis and earths, and also with the metallic oxides, forming with the latter in general coloured precipitates; it is uncertain, however, whether these colours are not in a great measure derived from the action of tannin adhering to it.

Gallic acid was at one time supposed to be the principle of astringency, from being contained in the vegetable astringents, and giving a dark colour with the salts of iron, the chemical test by which astringency appears to be indicated. It is doubtful, however, as has just been remarked, whether this latter property does not arise from the presence of tannin: the colour it does produce is less deep too, than that which the infusion itself strikes; and the acid in its insulated state has no astringency. Tannin is rather to be considered as the astringent principle, and it exists accordingly in some of the more powerful vegetable astringents, as in catechu or kino, with scarcely any trace of gallic acid.

Malic Acid is contained in the juice of unripe apples and other fruits; it is uncrystallizable, forming when evaporated a thick liquor, which, if the heat be continued, becomes charred. By this, and by the properties of the salts which it forms, it is distinguished from the other vegetable acids. By nitric acid it is converted into oxalic acid.

Citric Acid often accompanies the malic acid in the juices of unripe fruits, and it exists in a purer form in the juice of the lemon and lime; from these it is usually extracted, the mucilaginous matter of the juice being separated by alcohol. It crystallizes in rhomboidal prisms; which, when it is pure, are colourless; its taste is extremely sour; it is abundantly soluble in water; its solution undergoes spontaneous decomposition, but the crystallized acid can be preserved without injury. The more powerful acids decompose it, converting it principally into acetic acid.

Oxalic Acid exists in the juice of the sorrel (oxalis acetosella) and some other plants, combined with a portion of potass, not sufficient to neutralize it. It can also be artificially formed by subjecting fecula, gum, or sugar to the action of nitric acid. It crystallizes in slender prisms of a white colour; its taste is extremely sour; it is soluble in twice its weight of cold water, and an equal weight of boiling water; it is also soluble in alcohol; in large doses it is a very active poison. It is decomposed by the more powerful acids: in its decomposition by heat, it affords little empyreumatic oil; hence it appears to contain only a small portion of hydrogen; and as some of the other vegetable acids are converted into it by the action of nitric acid, there is probably a large proportion of oxygen in its composition. The test by which it is peculiarly distinguished, is the insoluble precipitate it forms with lime, an earth to which its affinity is such that it attracts it from all the other acids.

Tartaric Acid. This acid, as it exists in vegetables, is usually combined with potash, in such proportion, however, as to leave an excess of acid in the combination. This forms the super-tartrate of potash, which is contained in a number of vegetable fruits. It is deposited from the juice of the grape in its conversion into wine, or in the slow fermentation which the wine suffers when kept. The acid procured from this salt is in tabular crystals, transparent; they are very soluble in water, the solution when concentrated being of an oily consistence. It is decomposed by heat, affording a large quantity of liquid acid little changed, with much carbonic acid gas. By nitric acid repeatedly distilled from it, it is converted into oxalic acid. This acid is an important one in pharmacy, from the numerous combinations of it applied to medicinal use.

Benzoic Acid is obtained from the vegetable balsams, generally by the process of sublimation. It condenses in slender crystals, white and brilliant. It is volatile, and its vapour is inflammable; it is very sparingly soluble in cold water, but abundantly in hot water; the solution on cooling depositing nearly the whole of the acid in prismatic crystals; it is also soluble in alcohol, from which it is precipitated by cold water; it is pungent, but not very acid to the taste; in its usual state its smell is fragrant, especially when it is heated; but this odour seems to arise from a minute portion of the oil of the balsam adhering to it; as by repeated combinations with an alkaline base, and precipitation by an acid, it is obtained inodorous. It is not easily decomposed by the action of the more powerful acids. Decomposed by heat, it affords a larger quantity of empyreumatic oil than any other vegetable acid, whence hydrogen was supposed to predominate in its composition,—a supposition not confirmed by experiment, for, according to Berzelius, there are only 5.16 of that body in 100 parts.

Acetic Acid. This acid is more exclusively the product of fermentation; it exists, however, ready formed in the sap of the vine, and, combined with alkalis and earths, in the sap of plants. In its pure and concentrated state, in which state it can be procured only by artificial processes, it is a very powerful acid, highly pungent and fragrant, volatile and inflammable. It is distinguished by the peculiar action it exerts on some of the proximate principles of plants,—essential oil, resin, gum-resin, camphor, gluten, and caoutchouc, which it dissolves without decomposing. Hence, even in its diluted state, under the form of distilled vinegar, it is used as a solvent in pharmaceutic processes; though it is seldom that it can be employed to advantage, as it is liable to modify the powers of the substances it dissolves.

Prussic Acid. The substance to which this name is given, is formed from some varieties of animal matter by artificial processes. It had often been remarked that its odour is similar to that of the peach-blossom, and that the same odour is perceptible in the distilled water of the cherry-laurel, and of the bitter almond. This led to experiments on these; whence the fact, rather singular, has been discovered, that all of them contain this acid. The fact, not less important, has been established, that the narcotic property possessed by these distilled waters, depends on the prussic acid. In its insulated state it is volatile, so that it escapes even from its watery solution under exposure to the air. It has no sensible sourness, and does not redden the more delicate vegetable colours. The character of acidity is therefore given to it, rather from its powers in the combination it forms, especially those with the metallic oxides,

than from its properties in its insulated state,—these compounds being analogous to other saline combinations.

Several of the vegetable acids, particularly the citric, malic, and tataric, exist in the same vegetable, and in proportions varying according to the stage of vegetation, whence it is probable that they are mutually convertible. They are seldom pure, but generally in combination with saccharine, mucilaginous, and extractive matter. Combined with alkaline and earthy bases, they form what have been named the essential salts of plants.

The last of the proper proximate principles of vegetables is LIGNIN, or wood; the substance which, composing the vessels of the plant, is the basis through which the other principles are diffused, or to which they are attached, and which is the basis therefore of all the parts of vegetables, with the exception of their secreted juices. It is, when freed from the principles diffused through it, insipid, inert, and insoluble, liable in a humid state to slow spontaneous decomposition, inflammable, and is decomposed by heat, leaving a large residuum of charcoal, which indicates carbon to be its predominant ingredient, whence probably arises its solidity and comparative chemical inactivity. Being insoluble in water or in alcohol, it forms the greater part of the residuum, when the active matter of vegetable substances has been abstracted by maceration in these solvents. Several interesting experiments have been made on this substance by M. Braconnot, in order to discover the action of sulphuric acid on wood. Hempton cloth, or the sawings of horn-beam, when triturated with the acid, in proportion of 25 of the former to 32 of the latter, gave for the result a thick mucilage. This mucilage was then triturated with chalk, filtered, and evaporated; and after depositing sulphate of lime, seemed to be converted into gum. The lignin also, after being reduced to gum by the action of the sulphuric acid, was converted into sugar, by boiling it for 10 or 12 hours in water, and separating the acid by means of chalk.

Equal weights of lignin and caustic potash, heated in a silver crucible, afford a substance soluble in water; and if an acid is added, an abundant precipitation of ulmin takes place.

Besides the principles which can thus be obtained in a distinct form from vegetables by analysis, there are others of a more subtle nature, the existence of which has been supposed to be established by some facts, though they are scarcely capable of being exhibited in a insulated state; such are the Aroma or Spiritus Rector, the Acrid Principle, the Bitter Principle, and the Narcotic Principle.

The AROMA is the principle in which the odour of plants has been supposed to reside. This quality is generally found in the essential oil; but there are some vegetables, having a strong odour, which yield little or no essential oil, such as the jessamine, the violet, or the rose; or, if this oil be procured from them in small quantity, it has not that strength of odour which, considering their fragrance, and the smallness of its quantity, might be expected from them. They exhale this odour, however, when exposed to the air; it is at length dissipated; or it is communicated to water by distillation at a very gentle heat. Hence it has been concluded, that a principle more subtle than the essential oil exists, in which the odour resides, and that it is even this principle which communicates odour to the oil. But these facts are inconclusive. The property of odour may belong to any of the proximate principles of vegetables, and does

belong to the principles of very different kinds ; it exists in other bodies in which we cannot suppose the existence of any common principle ; nor is there any reason to assume the existence of such a principle in plants : and all the facts considered as favourable to the opinion, are accounted for on the supposition that essential oil is the more common principle of odour, and is capable of being volatilized in small quantity at a low temperature, and of thus being diffused through the atmosphere, or communicated to water.

The existence of an Acrid Principle has been inferred from an acrimony residing in some plants, which they lose on drying, while their other active powers remain ; and from this acrimony being in some cases transferred to water or alcohol by distillation. It is not very certain, however, if this quality is not in such cases connected with some of the known proximate principles ; nor has this acrid principle, if it do exist, been obtained so as to submit it to chemical examination.

Bitter Principle. A principle of bitterness has been supposed to exist in some vegetables. It is obvious, however, that this quality may belong to any of the known proximate princples ; and the characters which have been assigned to this principle as it exists in some of the purest vegetable bitters, particularly in gentian or quassia, such as equal solubility in water and in alcohol, and being precipitated by certain re-agents, rather prove it, in these cases at least, to be a variety of extractive matter.

A Narcotic Principle has been supposed to exist, from the narcotic power of some vegetables being impaired by age, without any apparent loss of matter, and from its being rendered inert by decoction, though no volatile matter is collected possessed of the quality. But such facts are rather favourable to the conclusion, that the loss of power is owing to chemical changes in one or other of the known principles, probably the extract, in which the narcotic quality may be supposed to reside. In submitting opium to analysis, it has been affirmed, that a crystalline matter is obtained, which proves narcotic, and this has been supposed to be the principle on which that quality possessed by the opium depends. But it does not, admitting its existence, appear to be possessed of the narcotic property in that high degree we should expect on this hypothesis.

The existence of all these principles, therefore, is problematical ; and the qualities assigned to them may, with more probability, be referred to modifications of composition in the known vegetable principles, which are probably too subtle to be determined by chemical analysis.

Alcohol, and the Ethers formed from alcohol by the action of acids cannot strictly be regarded as vegetable products ; yet they have a relation to these, as their chemical constitution is similar, and they cannot be formed but by changes produced in vegetable matter. As important medicinal and pharmaceutic agents, they are entitled to notice.

Alcohol is formed by the process of fermentation from saccharine matter, or from fecula, the latter being previously subjected, partially at least, to the operation of malting, by which it is converted into the former. The fermented liquor being distilled, affords alcohol diluted with water, and with some impregnation of odour from the fermented substance. From this pure alcohol is procured by repeated distillation, the abstrac-

tion of the water from it being aided by the action of potash, or sub-carbonate of potash.

Alcohol is a colourless transparent fluid, having a specific gravity, according to its state of concentration, from 0.835 to 0.800; it is fragrant and pungent, and in its action on the living system exerts a high degree of stimulant and narcotic power; it is volatile and inflammable, affording, during its combustion, water and carbonic acid, the quantity of water exceeding even the weight of the alcohol. It contains, therefore, much hydrogen in its composition, with which carbon is combined, and perhaps also a portion of oxygen. It combines with water in every proportion, and, in consequence of the affinity between these fluids, they mutually precipitate substances which either has dissolved, that are insoluble in the other. It is decomposed by the stronger acids, affording, as the principal product, the different ethers. As a pharmaceutic agent, it is of much importance from the solvent power it exerts on a number of the vegetable proximate principles,—essential oil, camphor, extract, and others, and is not less valuable from its property of counteracting the spontaneous changes to which vegetable matter is liable.

Ether. The name ether is given to a peculiar product obtained by the action of the more powerful acids on alcohol; it differs in its properties according to the acid employed in its formation, but in general is extremely light, volatile, and inflammable. Sulphuric ether, formed by the action of sulphuric acid on alcohol, has a specific gravity when it is pure, not more than 0.716; it is so volatile as to evaporate rapidly at the common temperature of the atmosphere; in burning it affords water and carbonic acid: its odour is fragrant and penetrating; its taste pungent; it is soluble in water only in limited proportion, about one part in ten. It exerts on the vegetable principles the same solvent action nearly as alcohol, except on extract, which it has been said to precipitate,—an effect, however, I have not been able to obtain from it. Nitric ether is equally light, and even more volatile; it is inflammable; it is soluble in water in limited quantity, but combines with alcohol in every proportion: its odour is strong and penetrating, Muriatic ether is still more volatile; it exists in the state of gas, under the atmospheric pressure at 60°; at 50 it becomes liquid, its specific gravity is 0.874; it is transparent, colourless, odorous, and pungent. Acetic ether is moderately light, volatile, and inflammable, soluble in water in limited quantity, and has an odour etherial, but approaching also to that of vinegar. All these ethers appear to differ from alcohol, principally in having a larger proportion of hydrogen in their composition, to which probably their greater levity and volatility are to be ascribed; and they generally contain a portion of the acid by the action of which they have been formed, which, in some of them at least, appears essential to their chemical constitution. Sulphuric ether seems to contain none.

Having pointed out the distinguishing properties, and the general pharmaceutic relations of the Proximate Principles of Vegetables, it may be proposed as a question important in relation to the object of the present outline—Do these principles usually exist in the vegetable in a state of chemical combination, whence some modification of their powers may result, or are they chemically mixed?

The latter appears to be generally the case. These principles can often be observed existing apart from each other, and even placed in separate vesicles ; they can in many cases be separated by mechanical means ; and even where they are more intimately mixed, that change of properties does not take place, which we must expect were they chemically united, the virtues of each principle being discernible in the mixture, weakened, but not changed. It seems to follow, therefore, that the virtues of vegetable substances do not depend on chemical combinations of their proximate principles, but rather on the peculiar ultimate composition of one or other of these principles. Hence, also, it is evident, that in separating the proximate principles of any vegetable, we cannot expect to alter or improve its virtues, farther than in concentrating them by a separation from what is inert, or in separating principles which are possessed of different, or even opposite powers. The attainment even of these ends, however, is in many cases of importance in their exhibition as medicines.

From the enumeration of the Proximate Principles of Vegetables, may be explained the rationale of those pharmaceutic processes to which plants are usually subjected.

Vegetable matter being liable to decomposition when in a humid state, from the re-action of its elements, and their entering into new combinations, Exsiccation is an operation to which they are generally subjected, to preserve them without injury. It is performed either by the action of a current of air, or by exposure to heat, care being taken that the heat shall not be such as to dissipate any of their volatile principles, or cause any chemical change.

Inspissation is an operation performed on the expressed juices of plants, with the same view, the dissipating the watery portion of the juice, and thus reducing it to a thick or solid consistence, rendering it less liable to those spontaneous chemical changes which it would otherwise undergo. It is performed by the application of a gentle heat.

By Infusion of vegetable matter in water, the fluid is impregnated with the gum, sugar, extract, tannin, saline substances, part of the essential oil, and part also of the resinous principle. The aroma of the plant is generally first taken up : by longer infusion the water is loaded with the colouring, astringent, and gummy parts : these are also most abundantly dissolved when the temperature is high. Hence an infusion differs, according as the water has stood longer or shorter on the materials, and according as it has been promoted or not by heat. An infusion made in the cold is in general more grateful, while one made with heat, or by keeping the fluid long upon the materials, is more strongly impregnated with active matter.

By Decoction or boiling, the solvent power of the water is farther increased ; and hence the liquor always appears darker coloured, and it is more loaded with those principles of the vegetable which it can hold dissolved. Those, however, which are volatile, particularly the essential oil, are entirely dissipated ; and therefore it is an improper process for vegetables, the virtues of which depend, wholly or partially, on these principles. Even some of the fixed principles of vegetables are injured by long decoction. The extractive matter, for instance, gradually absorbs oxygen from the atmosphere, and is converted into a substance nearly insipid and inert. Opium, Peruvian bark, and many other vegetables, are injured in this manner by decoction, especially if the atmospheric air is freely admitted ; and these two circumstances, the dissipation of the

volatile matter, and the oxygenation of the extractive, considerably limit the application of this process. It is still used, however, with advantage, to extract the mucilaginous parts of vegetables, their bitterness, and several others of their peculiar qualities.

Alcohol may be applied to vegetables to dissolve those principles which are not soluble in water, such are their essential oil, camphor, and resin; and as these are often the principles on which the virtues of vegetables depend, these solutions, or Tinctures as they are termed, are often active preparations. Equal parts of alcohol and water, in general, extract still more completely the active matter of plants, as we thus obtain a solution of all those substances which are separately soluble in either of these fluids. And these solutions, whether with pure or dilated alcohol, have the advantages of not being liable to spontaneous change.

When, by the action of one or both of these fluids, a solution of the active principles of a vegetable is obtained, it may be evaporated to the consistence of a thick tenacious mass. This forms what is termed an Extract; it is named an Aqueous Extract when obtained from the aqueous infusion or decoction of a plant, and Spirituous when alcohol has been the solvent. The design of this preparation is to obtain the active matter of the vegetable in a small bulk, and in such a state that it may be preserved without suffering any alteration. It is evident, that it is a process which can be properly applied to such plants only as have their virtues dependent on some of their fixed principles, and even these are often injured by the heat applied, and the free access of the atmospheric air.

Distillation is another process applied to vegetable substances, by which we obtain some of their active principles, particularly their essential oil. If the vegetable matter be heated with a large portion of water, the oil is volatilized with the aqueous vapour: it separates from the water on being allowed to remain at rest; a part of it, however, is also dissolved, and communicates a considerable degree of flavour, and often also of pungency. This forms what are named Distilled Waters. If alcohol be used instead of water, the essential oil is entirely dissolved in it, and we thus obtain what are termed Distilled Spirits.

By such processes we extract the active matter of vegetables from the inert matter with which it is more or less mixed, and are thus enabled to administer many remedies under a variety of forms, suited to particular circumstances. A single example will show the utility of investigations of this kind, respecting the component principles of vegetable products, and their relations to the more important chemical agents. Peruvian bark is one of the most important remedies in the Materia Medica. It is not always, however, practicable to exhibit it in substance with advantage, as where the stomach is uncommonly irritable, or where, from the nature of the disease, it is necessary to give it in large doses, frequently repeated, it is liable to occasion sickness and other uneasy sensations, and even to be rejected by vomiting. Such inconveniences are attempted to be obviated, by giving it in the different forms of infusion, decoction, tincture, or extract, as any of these may be best suited to the case. Our knowledge of its constituent parts can only lead us to the proper application of these processes. From an accurate analysis of this bark, it has been proved, that seven parts out of eight consist of woody fibre, or of a matter inert and insoluble, which cannot act on the system, and which affects the stomach only by its weight and insolubility. The remaining

eighth part is that in which the activity of the medicine resides: it is therefore evident, that if this be extracted, without injuring its activity, the medicine could be exhibited with much more advantage. This is in part accomplished by the preparations of it that have been mentioned: but even these do not convey it in all its force. If the bark be infused or boiled in a certain quantity of water, the infusion or decoction is not nearly equal in efficacy to the whole quantity operated on. It is therefore evident, that during either of these operations, the active matter has not been entirely extracted, or has suffered some change. And here Chemistry farther elucidates the peculiar nature of this substance. and the changes produced in it by these processes. It has been found, that the matter on which the power of this bark depends is liable to oxygenation, and that during the infusion, and particularly the decoction of that drug, it suffers this change from the action of atmospheric air, and is converted into a substance insipid and inert. This leads to the improvement of the preparations of this medicine; and experiments instituted for the purpose have accordingly proved, that while by long boiling, the virtues of the bark are nearly destroyed, they are extracted with less loss by a few minutes decoction in covered vessels. The same investigations have pointed out the nature of the action of some other substances on bark, formerly not well understood. Thus, it had been found by experience, that the alkalis, and more particularly magnesia, enable water to extract the virtues of bark more completely by infusion,—a circumstance elucidated by the fact afterwards discovered, that the extractive matter of the bark, to which its activity is owing, combines with these substances, and forms soluble compounds.

Similar examples might be given from other important vegetable remedies, which would sufficiently prove the utility to be derived from the analysis of the substances belonging to the vegetable kingdom, and that indeed researches of this kind are absolutely necessary for their proper preparation as medicines.

The account of the analysis of animal substances, and of their proximate principles, would, to the same extent at least, be foreign to the objects of this sketch, as so few of these substances are employed in medicine; and of those which are used, the composition, and consequently the pharmaceutic treatment, are in a great measure peculiar to each.

Their general chemical characters are similar to those of vegetable principles.—Composed of a few ultimate elements, the differences in their properties arise in a great measure from the different proportions, or the different modes in which these are combined. And these elements having powerful reciprocal attractions, and being disposed to enter into combinations almost indefinitely diversified, these substances are extremely susceptible of decomposition, from the re-action of their elements. favoured by humidity, by the action of the air, or by elevation of temperature. They are even more liable to this than vegetable substances; for the elements existing in simultaneous combination are more numerous, their affinities are therefore more nicely adjusted, and of course the equilibrium is more easily subverted.

Along with carbon, hydrogen, and oxygen, which are the chief constituent principles of vegetable matter, nitrogen, and frequently sulphur and phosphorus, enter into the composition of animal substances. Hence, when decomposed by heat, they afford products composed of these, of which ammonia is always the principal; and the reaction of those princi-

ples, and the evolution of the products arising from this, seem principally to form the series of changes which constitute putrefaction, the species of spontaneous decomposition to which animal matter is more peculiarly subject.

Like vegetable substances, the animal products consist of various proximate principles, and some analogy may be traced between several of the vegetable and animal proximate principles. Animal fat has a strict connection in properties and composition with fixed oil; animal mucus resembles vegetable mucilage; fecula has a similar relation to gelatin; vegetable and animal gluten are nearly, if not entirely, the same; a substance similar to saccharine matter exists in milk, and in some of the other animal secretions; in the bile is found a principle strictly analogous to resin: and benzoic, oxalic, and acetic acids, are common to both. Hence, generally speaking, the few animal substances belonging to the Materia Medica are acted on by the usual solvents in nearly the same manner as vegetable substances, and are submitted to similar pharmaceutic processes. The results of these are similar officinal preparations. Thus, by the action of alcohol, the active matter of musk, castor, and cantharides, is extracted, and tinctures of these are employed. In other cases, water is the proper solvent, particularly of those which consist of gelatin; but such solutions being very liable to decomposition, must always be of extemporaneous preparation.

CHAP. II.

OF THE PHARMACEUTICAL OPERATIONS TO WHICH THE ARTICLES OF THE MATERIA MEDICA ARE SUBJECTED.

Natural substances are not always obtained in that state in which they are best adapted to exhibition as remedies. They are subjected, therefore, to various processes, with the view of preparing them for use, and to complete this statement of the Principles of Pharmaceutic Chemistry, the nature of these is to be pointed out.

These processes, or at least the greater number, and the most important of them, are chemical, and are dependent therefore on the agencies of those general forces whence chemical changes arise; they are indeed little more than applications of these, under peculiar regulations adapted to different substances. The general facts, therefore, connected with the operation of these forces, are first to be stated in so far as they have any relation to the present subject.

The force principally productive of chemical action, is that species of attraction which is exerted between the particles of bodies, and bring them into intimate union. If two substances of different kinds be placed in contact, and with that degree of fluidity which admits of the particles of the one moving to those of the other, it often happens that they unite together, and form a substance in which neither can be any longer recognised, which is homogeneous, and in general possessed of new properties. This constitutes what, in a language of chemistry, is named Combination, and it is conceived to arise from an attraction exerted between the particles of the one body and those of the other. This species of attraction, denominated Chemical from being productive of chemical pheno-

mena, sometimes also named Affinity, is distinguished from the other species of attraction by the phenomena to which it gives rise, or by the laws it obeys.—from the attraction of gravitation, by not being exerted at sensible distances, or on masses of matter, but only at insensible distances, and on the minute particles of bodies,—from the attraction of aggregation, by being exerted between particles of different kinds, and forming a substance with new properties, while aggregation operates on particles of a similar nature, and unites them into an aggregate in which the same essential properties exist. It is possible, however. that these forces, though thus distinguished, may be the result of the same power modified by the circumstances under which it acts.

The substance formed by chemical combination is named a Compound. The substances united are the constituent or component parts or principles of the compound. When they are separated, the process is named Decomposition. The most minute parts into which a body can be resolved without decomposition, are named its integrant parts ; and it is between these that the force of aggregation is conceived to be exerted. Chemical attraction is exerted between the constituent parts.

The most important phenomenon attending chemical combination, is a change of properties. In general, the form, density, colour, taste, and other sensible qualities, as well as the fusibility, volatility, tendency to combnation, and other chemical properties in the compound, are more or less different from what they are in either of its constituent parts, and frequently, indeed, they are wholly dissimilar. There are cases, however, where the change is less considerable, as is exemplified in several of the operations of Pharmacy,—the solution of the vegetable proximate principles in water or in alcohol, or the solution of salts in water, in which the body acquires merely the liquid form, with perhaps a slight change of density, but in which no important property is changed, nor any new one acquired.

Chemical attraction is not an invariable force exerted by every body to every other, and always with the same degree of strength. Between many substances, it does not sensibly operate, though this perhaps may be owing to the predominance of external circumstances, by which its operation is influenced, rather than to the absence of all mutual attraction. It is exerted too by each body towards others, with different degrees of strength.

It is not limited in its action to two bodies, but is frequently exerted at the same time between three, four, or a greater number, so as to unite them into one combination. Such compounds are named Ternary, &c. according to the number of their constituent principles ; they are abundant among the productions of nature, and can be formed also by the arrangements of art.

This force is exerted too, so as to combine bodies in more than one proportion. And from the union of two substances in different proportions, compounds are formed frequently as dissimilar in their properties as if they were composed of principles totally different. In some cases, the combination is unlimited with regard to proportions : in others it is fixed to two or three relative quantities, which are definite, and there are examples where it can be established in only one proportion. Where combination takes place between two bodies in more than one definite or fixed proportion, an important general law, only lately elucidated, appears to be observed, that a simple arithmetical ratio exists between the differ-

ent proportions, the larger proportion being a simple multiple of the smaller; taking the proportions, for example, of one ingredient, the ratio is often that of 1, 2, 3, the quantity of the other ingredient remaining the same. This law is of great importance in chemical analysis.

The compounds formed by the exertion of chemical attraction have apparently the same relation to this power as simple bodies have: they have a similar tendency to combination, unite in different proportions, and with different degrees of force; and all these combinations are accompanied by the same phenomena, and appear to observe the same laws. It has been supposed, however, that when compound substances combine together, the combination is the result, not of the mutual attraction between the integrant particles of these compounds, but of the affinities of their ultimate elements modified by the condition in which they exist.

In all cases, attraction is modified, and its results determined, by circumstances foreign to the attractive force itself. The operation of these circumstances is important, and is often so in relation to the processes of Pharmacy. They require, therefore, more distinct enumeration.

1*st*, Quantity of matter seems to influence affinity, an increase in the relative quantity of one body with regard to another enabling it to act with more force. This is inferred from there being cases in which an effect can be produced from the mutual action of two bodies, when one is in a certain relative proportion to the other, which will not be obtained when the proportion is changed; a compound, for example, may be decomposed by a substance exerting an attraction to one of its ingredients, when the decomposing substance is present in large quantity, while the decomposition will not happen, or will at least be much less complete, from its action in a smaller quantity. Hence, too, decomposition is often only partial; for in proportion as an ingredient is abstracted from another with which it has combined, the quantity of the latter becoming relatively larger to the portion of the former which remains, adds to the force of its affinity, so that it is capable of counteracting the action of the decomposing substance, and preventing it from being entirely abstracted. Both of these circumstances are of much importance in Pharmacy, and render necessary particular attention towards insuring the uniform strength of active preparations.

2*d*, Cohesion, or the state of a body with regard to the aggregation of its integrant particles, modifies the chemical action of another body upon it, by opposing a resistance which must be overcome before the union of their particles can be effected; hence the cause that two solid bodies seldom act chemically on the other, and that fluidity promotes chemical action. But besides this, cohesion, even when it has been overcome, modifies the exertion of chemical attraction, by resuming its force whenever the force of that attraction is diminished, and thus sometimes giving rise to new combinations; and sometimes, too, when suddenly established in consequence of the affinities becoming effective, it determines the proportions in which bodies combine, by insulating the compound at a certain stage of the combination. Insolubility is merely the result of the force of cohesion, in relation to the liquid which is the medium of chemical action, and its action is of course similar; it counteracts combination, by withdrawing the insoluble substance from the action of a body exerting an attraction to it; and by the same operation, it insolates a compound when it is formed; and great Density or specific gravity, has even some influence on combination in a simi-

lar manner, counteracting it, by withdrawing the heavier substance from the action of the other.

3*d*, Elasticity, or that property of bodies arising from repulsion between their particles, and present to any extent only in those existing in the aëriform state, opposes the exertion of chemical attraction, by enlarging the distances at which these particles are placed. Hence aërial fluids combine in general with difficulty; and hence, too, a compound which contains an aërial ingredient, is more easy of decomposition, and the decomposition is more complete, than a compound, the ingredients of which are fixed; for the tendency to elasticity in the volatile substance counteracts the mutual affinity; and when, by the application of heat, or the operation of a superior attraction, any portion of it is displaced, it is immediately withdrawn by assuming the elastic form, and ceases to oppose any obstacle by its affinity or quantity to the progress of the decomposition. Elasticity, too, by counteracting attraction, places limits to the proportions in which bodies combine.

4*th*, The last circumstance influencing attraction is Temperature, or the state of a body with regard to heat or cold: it sometimes favours, and in other cases subverts combination. The cause of temperature is a peculiar subtle power or principle, Heat or Caloric, capable of being communicated to bodies, and of being in part withdrawn from them. Its tendency is to establish a repulsion between their particles; hence it gives rise to expansion or enlargement of volume, greater in each body according to the quantity of caloric introduced. This progressive augmentation of distance, at which the particles are placed by its action, is accompanied with a proportional diminution in the force of cohesion; if carried, therefore, to a certain extent, that force is so far modified, that the particles become capable of moving easily with regard to each other,—a state which constitutes fluidity; and, if the communication of caloric be continued, the expansion still continuing, the particles are at length placed at such distances, that the attraction is entirely overcome, and they repel each other,—a state which constitutes the aërial or gaseous form. The operation of caloric, by producing these changes in the cohesion and elasticity of bodies, must evidently influence chemical attraction,—it favours combination by diminishing cohesion, it counteracts or subverts it by communicating or increasing elasticity; and these effects are often produced together, and modify each other.

From the difference of the forces of affinity among bodies, or from the operation of those circumstances by which it is modified, its power is often suspended or overcome, and substances which have been combined are separated. This forms what is named Decomposition, which presents results equally important with those from Combination.

The decomposition may be simple, that is, a compound may be resolved into its constituent parts, each of which becomes insulated. This is in general effected by the agency of heat. Within a certain range of temperature, the mutual affinity continues to operate; but when the temperature is raised, and when the bodies differ in their volatility or tendency to assume the elastic form, the elasticity of the more volatile one is so far favoured by the heat, that the affinity is overcome, and it is disengaged. It is generally obtained pure; but the fixed substance, from the influence of quantity on chemical attraction, frequently retains a portion of the other combined with it.

Decomposition is more complicated when it is produced by the intro-

duction of a third substance, which exerts an attraction to one of the ingredients of a compound. When this is effective, the body added combines with this ingredient, forming a new compound, and it is only the other ingredient of the original compound that is obtained insulated. A case still more complicated is, where two compound substances are brought to act on each other, and the principles of the one exert affinities to those of the other, so that an interchange takes place, the two compounds are decomposed, and two new ones are formed. The former case has been named by chemists, single elective attraction ; the latter, double elective attraction ; and both were considered as the results of the relative forces of attraction among the bodies concerned. But there is reason to believe that they rise from, or at least are very materially determined by, the operation of cohesion, elasticity, and the other forces that influence attraction ; and that, but for the operation of these forces, three or more bodies presented to each other would often enter into simultaneous union, instead of passing into binary combinations.

Galvanism, as well as Caloric, influences chemical affinity, and, by the attractive and repulsive forces it exerts, is even more powerful in producing decomposition. It scarcely admits, however, of being applied to any pharmaceutic process. Light, too, has an effect in producing chemical changes which sometimes requires to be attended to, and in particular to be obviated in so far as it gives rise imperceptibly, which it sometimes does, to changes in the medicinal properties of bodies. Its general agency is that of expelling or causing the transfer of oxygen.

The operations of Pharmacy are generally dependent on these chemical powers; they consist of arrangements of circumstances, with the view either of promoting their exertion, or of obtaining the products of chemical action.

Some preliminary operations are frequently had recourse to of a mechanical nature, to diminish the cohesion of bodies, or enlarge their surface. Such are Pulverization, Trituration, Levigation, Granulation, &c. Pulverization is the term employed where solid bodies are reduced to powder by beating : Trituration that where the same effect is produced by continued rubbing. Levigation denotes the operation where the powder is triturated to a great degree of fineness, the trituration being facilitated by the interposition of a fluid, in which the solid is not soluble. As by any of these operations, the powder must consist of particles of unequal size, the finer are separated from the coarser by sifting or washing. Sifting is passing the powder over a sieve, the interstices of which are so minute as to allow only the finer particles to pass. Washing, or Elutriation, is an operation performed on substances which are not soluble in water. The powder is diffused through a quantity of that fluid, and the mixture is allowed to remain at rest. The coarser particles quickly subside, and the finer remain suspended. The fluid is then decanted off, the powder is allowed to subside, and is afterwards dried. These methods of reducing bodies to powder, can be applied to few of the metals, their force of cohesion being too strong. They are mechanically divided by rasping, or by being beat into leaves, or they are granulated,—an operation performed by melting the metal, and when it is cool-

ed down as far as it can be without becoming solid, pouring it into water; it passes to the solid state, assuming a granular form.

In Pharmacy, these operations are sometimes of importance, besides merely promoting chemical combination, as there are some medicines which act with more certainty, and even with more efficacy, when finely levigated, than when given in a coarse powder. As means of promoting chemical combination, it is evident that they can act only indirectly; the bodies being far from being reduced to their minute particles, between which only chemical attraction is exerted. They are therefore employed, merely as preliminary to those operations in which such a division is obtained by chemical means.

Of these the first is Solution. By this is understood that operation in which a solid body combines with a fluid in such a manner, that the compound retains the fluid form, and is transparent. Transparency is the test of perfect solution. When the specific gravity of a solid body differs not greatly from that of a fluid, it may be diffused through it, but the mixture is more or less opaque; and on being kept for some time at rest, the heavier body subsides; while in solution the particles of the solid are permanently suspended by the state of combination in which they exist, and are so minute as not to impair the transparency of the liquid.

The liquid has in the case of solution been regarded as the body exerting the active power, and has been named the Solvent or Menstruum; the solid is considered as the body dissolved. The attraction, however, whence the effect arises, is reciprocal, and the form generally depends on the larger quantity of the liquid employed, and the absence of cohesion being more favourable to the combination proceeding to a greater extent.

In general, a solid can be dissolved in a liquid only in a certain quantity. This limitation of solution is named Saturation; and when the point is reached, the liquid is said to be saturated with the solid. As the fluid approaches to saturation, the solution proceeds more slowly. When a fluid is saturated with one body, this does not prevent its dissolving a portion of another; and in this way three, four, or five bodies may be retained in solution at the same time by one fluid. In these cases, the fluid does not dissolve so large a proportion of any of these substances, as if it had been perfectly pure, though sometimes the whole proportion of solid matter dissolved is increased from the mutual affinities the bodies exert. Neither is the solvent power always thus limited, there being many cases where a solid may be dissolved in a fluid to any extent. Gum or sugar, for example, will dissolve in water, in every proportion.

An increase of temperature, in general, favours solution, the solution proceeding more rapidly at a high than at a low temperature; and in those cases in which a certain quantity only of the solid can be combined with the fluid, a larger quantity is taken up when the temperature is increased. The quantity dissolved is not in every case promoted alike by an increase of temperature; water, for example, having its solvent power, with regard to nitre, greatly increased by heat, while sea-salt is dissolved in nearly as great a quantity by cold as by hot water. This difference in these salts, and in many others, depends on the difference in the degree of their fusibility by heat; those which are most easily fused having their solubility in water most largely increased by increase of temperature. All these facts, indeed, with regard to solution, are explained, by consi-

dering this operation as depending on chemical affinity overcoming cohesion in the body dissolved.

Agitation favours solution by bringing the different parts of the liquid into contact with the solid, and thus preventing the diminished effect which arises from the approach to saturation in the portion covering the solid. The mechanical division of a solid, too, is favourable to its solution, principally by enlarging the surface which is acted on.

Solution is an operation frequently had recourse to in pharmaceutical chemistry, the active principles of many bodies being dissolved by their proper solvent. Salts are dissolved in water, as are also gum, extract, and other vegetable products. Products of a different kind, as resin, camphor, and essential oils, are dissolved in alcohol and wine: and metals are rendered soluble and active by the different acids. Solutions in water, alcohol, or wine, possess the sensible qualities and medical virtues of the substance dissolved. Acid and alkaline liquors change the properties of the bodies which they dissolve. In Pharmacy, the operation receives different appellations, according to the nature of the solvent, of the substance dissolved, and of the manner in which it is performed. When a fluid is poured on a vegetable matter, so as to dissolve only some of its principles, the operation is named Extraction, and the part dissolved is said to be extracted. If it is performed without heat, it is termed Maceration; if with a moderate heat, Digestion; if the fluid is poured boiling hot on the substance, and they are kept in a covered vessel till cold, it is denominated Infusion: Decoction is the term given to the operation when the substances are boiled together. Tinctures are solutions obtained by infusion or digestion in alcohol. It is evident that these are all instances of solution, varied only by particular circumstances; and I have already stated under the analysis of the vegetable part of the Materia Medica, the advantages belonging to each. Lixiviation is the term applied to solution performed on saline substances where the soluble matter is separated, by the action of the solvent, from other substances that are insoluble; and the solution obtained in this case is termed a Ley.

The other principal method by which that fluidity necessary to chemical action is communicated, is Fusion. It requires merely, with regard to each substance, the necessary degree of heat; and where this is high, it is performed usually in crucibles of earthen ware, or sometimes of black lead, or on a large scale in iron pots.

Chemical combination is frequently promoted by an elevation of temperature, though the heat may not be so high as to produce fusion, but only to diminish cohesion to a certain extent. Calcination, as it used to be named, or metallic oxidation, is an example of this; a metal being heated to a high temperature, so as to enable it to combine with the oxygen of the air. Deflagration is a similar operation, an inflammable or metallic substance being exposed to a red heat in mixture with nitre; the acid of the nitre yields its oxygen; which being thus afforded in large quantity and nearly pure, the oxidation takes place rapidly, and generally to its *maximum*.

When chemical action has been exerted, other operations are sometimes required to obtain the product, or sometimes this product is formed and collected in the operation itself.

By Evaporation, or dissipating a liquid by the application of heat, a solid substance which has been dissolved in it is recovered, and this opera-

tion is one frequently performed in Pharmacy. When performed on a small scale, vessels of glass, or of earthen ware, are employed, and the heat is applied either by the medium of sand forming the sand bath, or, if it is required to be more moderate, the vessel is placed over water which is kept boiling, forming what is named the Water Bath, or *Balneum Mariæ*. When performed on a larger scale, shallow iron pots or leaden troughs are used, to which the fire is directly applied: and experiments have shewn that the operation is conducted more economically when the liquor is kept boiling strongly, than when it is evaporated more slowly by a more gentle heat. There is, on the other hand, however, some loss, from part of the dissolved substance being carried off when the heat is high by its affinity to the liquid evaporating; and in many cases in Pharmacy, particularly in the evaporation of vegetable infusions or tinctures, the flavour, and even the more active qualities of the dissolved substance, are liable to be injured, towards the end of the operation, by a strong heat.

When the object is to obtain the volatile matter by evaporation, the process is conducted in close vessels, adapted to condense the vapour and collect the liquid. This forms the operation of DISTILLATION, which, with regard to different substances, requires to be conducted in various modes.

When a volatile principle is to be obtained from vegetable substances by this process, the difficulty is to apply the heat sufficiently, without raising it too high. The mode employed is to heat the vegetable matter with water, and the distillation is then usually performed in the common still. At the heat of boiling water, the essential oil of plants, which is the chief volatile principle they contain, is volatilized; it rises with the watery vapour; is condensed: if little water has been employed, the greater part of the oil is obtained apart; if much has been used, it retains it dissolved, acquiring taste and flavour, and thus forming the distilled waters of plants. If alcohol, pure or diluted, has been the medium of distillation, it always retains the oil in solution, and forms what are named Distilled Spirits The still in which the operation is performed with these views is of copper or iron; it consists of a body and head, the former designed to contain the materials, and to which the fire is applied, the latter to receive the vapour; there issues from it a tube, which is connected with a spiral tube, placed in a vessel, named the refrigeratory, filled with cold water. The vapour, in its progress through the tube, is condensed, and the liquid drops from the extremity of it.

When metallic matter would be acted on, by the materials or the product of distillation, vessels of glass or earthen ware are employed; the retort, which is generally used, being connected with a single receiver, or with a range of receivers, according as the vapour is more or less easily condensed; or if the product is a permanently elastic fluid, which cannot be condensed but by passing it through water, a series of bottles connected by tubes, on the principle of Wolfe's apparatus, is used. When the product of distillation is not perfectly pure, it can often be purified by a second distillation: the process is then named *Rectification*: when it is freed from any superfluous water combined with it, the operation is named *Dephlegmation* or *Concentration*.

When the product of volatilization is condensed, not in the liquid, but in the solid form, the process is named SUBLIMATION, and the product is a Sublimate. As the condensation, in this case, takes place with greater facility, a more simple apparatus is employed, consisting usually of a co-

nical bottle or flask, with a round bottom, thin and equal, named a Cucurbit, in which the materials are contained, heat being applied by the medium of a sand bath. The vapour condenses in the upper part of the flask, forming a cake, which adheres to it, the orifice being lightly closed to prevent any part from being lost; or a globular head, with a groove at its under edge, and a tube to convey off any liquid that may be condensed, (a Capital as it is named), is applied.

When a solid substance is thrown down from a liquid by chemical action, it forms the operation of Precipitation, and the matter thrown down is named a Precipitate. Frequently the substance precipitated is one that has been dissolved in the liquid, and which is separated by a substance which renders it soluble, and weakening its attraction to the one which it held in solution. Or sometimes it arises from a compound being formed by the union of one body with another, insoluble in the liquid that is the medium of action. The precipitate is allowed to subside, is usually washed with water, and is dried. From the law of chemical attraction, that quantity influences the force of affinity, it often happens that the precipitate either retains in combination a portion of the substance by which it had been dissolved, or attracts a portion of the substance by which it is thrown down, and this sometimes proves a source of impurity, or of peculiar powers in medicinal preparations.

When a substance, in passing to the solid state, whether from fusion or solution, assumes a regular geometric form, the process is named Crystallization, and these figured masses are denominated Crystals. Their forms are various, though nearly constant with regard to each substance; they are usually transparent, hard, and have a regular internal structure. The crystallization may happen in two ways from a state of solution. If a saturated solution has been prepared with the aid of heat, the increased quantity of the solid, which the heat has enabled the liquid to dissolve, separates as the temperature falls; and the attraction of cohesion being thus slowly exerted between the particles, unites them so as to form crystals. Or, if a portion of the solvent be withdrawn by evaporation, and especially by slow evaporation, the particles of the solid unite slowly, and with a similar result.

In both these kinds of crystallization from a watery solution, the crystallized substance always retains a quantity of water, and frequently even a considerable proportion, in its composition. It is essential to the constitution of the crystal, its transparency, structure, and form, and is hence named the Water of Crystallization. Some crystals lose it from exposure to the air, when they are said to effloresce; others attract water, and become humid, or deliquesce.

Crystallization is promoted by the mechanical action of the air; likewise by affording a nucleus, whence it may commence, and especially a crystal of the substance dissolved; and with regard to a few substances, their affinity to the solvent requires to be diminished by the addition of another substance to enable them to crystallize.

In Pharmacy, crystallization is of importance by enabling us to obtain substances, especially those belonging to the class of salts in a pure form; different salts, even when present in the same solution, being thus separated by their different tendencies to crystallization, according as they are more or less soluble in the solvent, or have their solubility more or less promoted by heat, and each salt, when it does crystallize, being in general pure.

These are the principal operations of Pharmacy. Connected with this subject, there remain to be noticed the weights and measures which are usually employed. The division, according to what is named Troy weight, is that ordered in the Pharmacopœias. Its parts, with the symbols by which they are denoted, and their relative proportions, are represented in the following table:

A pound (libra),	℔	contains	12 ounces.
An ounce (uncia),	℥	———	8 drachms.
A drachm (drachma),	ʒ	———	3 scruples.
A scruple (scrupulus),		———	20 grains (grana) gr.

Measures have been subdivided in a similar manner, being made to correspond to the specific gravity of water. As the specific gravities of liquids vary considerably, a source of error is introduced in applying the standard measures to different liquids, unless the due allowance be made for the differences in specific gravity. This, it is to be presumed, will often be neglected, and hence the Edinburgh College have rejected the use of measures, and given the proportions of every liquid by weight. The use of measures, however, in apportioning liquids, those at least which are not too dense, being more easy and convenient, will probably always be retained; and it is therefore sanctioned by the Dublin and the London Colleges, in their late edition of their Pharmacopœias. The Dublin College adopt the usual division of the wine gallon into eight pounds or pints, the pound into sixteen ounces, and the ounce into eight drachms. The London College distinguish them, at the same time, by particular appellations, which cannot be confounded with those denoting the weight. These are represented with their symbols in the following table:

A gallon	(congius)		contains	8 pints.
A pint	(octarius),	O	———	16 fluidounces.
A fluidounce	(fluiduncia),	f℥	———	8 fluidrachms.
A fluidrachm	(fluidrachma),	fʒ	———	60 minus, (minima), ♏.

This last measure is one newly introduced. In apportioning liquids into very small quantities, the quantity has been usually estimated by drops (gutta, gtt.) allowed to fall from the edge of the mouth of a bottle; but the size of the drop is liable to vary, not only according to the mobility and specific gravity of the liquid, a circumstance of inferior importance, since with regard to each substance it remains the same, but also according to the thickness of the edge of the vessel, and the degree of inclination. The London College have therefore substituted this division of minims, which are measured in a slender graduated glass tube. It is necessary to recollect that these minims have no strict relation to drops, as indeed is evident from the circumstance, that a drop is a very variable quantity, both in size and weight, from different liquids. A drop of water is equal to about a grain, but 60 grains of alcohol are equal to about 175 drops of it, 60 grains of white wine to 96 drops, and 60 grains of tinctures with diluted alcohol, to from 135 to 145 drops. The measures of a table and of a tea spoonful are sometimes used in extemporaneous prescription, and, though not very accurate, may be admitted, were a small difference in the dose is not important. The one is understood to be equal to half an ounce by measure, the other to about one drachm.

PART II.

OF MATERIA MEDICA.

Materia Medica, in the extensive signification which has been attached to the term, comprises the history both of Aliments and of Medicines. It is used, however, more frequently and more correctly, as opposed to the Materia Alimentaria; and in this limited sense may be defined—that department of Medicine, which describes the properties, and investigates the effects on the living system, of those substances which are employed as remedies against disease,—substances which are not necessary to the immediate support of the functions of life, to repair the waste of body, or to furnish matter whence its secretions are derived, but which are more peculiarly adapted to excite actions in the system, or produce changes, with a view to the removal of morbid states. It includes the history of these substances, independent of the preparations to which they are subjected to fit them for administration, this belonging to the department of Pharmacy.

CHAP. I.

PRELIMINARY OBSERVATIONS ON THE OBJECTS OF STUDY IN THE HISTORY OF THE ARTICLES OF THE MATERIA MEDICA, AND ON THEIR CLASSIFICATION.

The subjects of inquiry, in the study of the articles of the Materia Medica, may be comprised under their Natural History, their Chemical History, and what may be more strictly denominated their Medical History.

The utility of Natural History in furnishing appropriate characters by which the productions of nature may be distinguished from each other, is abundantly obvious; and its application to the articles of the Materia Medica is under this point of view indispensable. From want of such characters, many of the remedies described by the ancient physicians cannot now be accurately ascertained; did we not possess them, *our* observations would, in the progress of time, be liable to the same inconvenience; and the accurate distinctions which the methods of natural history afford, are at present necessary to discriminate between substances which have a near resemblance to each other, or to describe with accuracy the remedies employed in different countries.

This subject has likewise been considered under a higher point of view. From attention to the characters of the articles of the Materia Medica, as they are objects of natural history, it has been supposed, that assistance may be derived in the investigation of their virtues. In those artificial systems of classification, indeed, in which the arrangements are

founded on a few leading discriminating characters, the natural alliances which exist among bodies are often disregarded, and they are in no case particularly traced; the substances which are associated being placed together merely from possessing these characters, though they may differ widely in the general assemblage of their qualities. But in those natural methods of classification in which the arrangement is founded on the concurrence of a number of characters taken from what is essential to the substance, the gradations of nature are more strictly observed, and those bodies are arranged together, which, in their general appearance, nature, and qualities, have a close resemblance. It is the prosecution of this natural method that has been supposed useful in ascertaining the medicinal virtues of the productions of nature,—a supposition not unreasonable, since, where there exists a natural resemblance in structure and qualities, it is no improbable inference that there may be a resemblance in medicinal powers.

In the vegetable kingdom especially, this natural affinity has been industriously traced and applied to this purpose. Those vegetables which agree in their general structure, habit, and appearance, are thrown into what are named Natural Orders or Families; and experience has shewn, that the individuals composing many of these natural orders have a remarkable similarity in their effects on the system. In the subdivisions of the order. this analogy is not less striking, the different species having, in general, similar virtues. If, therefore, a new species of any of these genera be discovered, the discoverer may infer, with some probability, *a priori*, that it will possess virtues similar to those of the genus to which it belongs.

This criterion of the virtues of medicines, though undoubtedly so far just, is however liable to many exceptions. Many natural orders are composed of vegetables, which, though they agree in structure, have the most various and opposite qualities; and even in those in which there is the greatest similarity, there are important differences in the properties of many plants arranged under them. Even in the subdivision of the genus, there is often a remarkable difference in the properties of the species; and what sufficiently points out the deficiency of this method, different parts of the same plant have frequently opposite powers. Yet it is to be admitted, that with all these exceptions, Naturalists have often been led by such analogies to just conclusions respecting the virtues of plants; and in studying the vegetable part of the Materia Medica, attention is undoubtedly due to these natural distinctions.

A part of the Natural History of Medicines, of not less importance than their generic and specific characters, is the accurate description of their sensible qualities.

Such descriptions afford the most obvious method of distinguishing them, and in many cases also the most easy and certain criterion of their purity and perfection. A knowledge of these qualities is not less necessary in leading to their proper administration, since, from the peculiar qualities of taste, flavour, specific gravity, or consistence in any substance, one form may be better adapted to its exhibition than another.

It has also been imagined, that the sensible qualities of medicines, particularly their taste and smell, afford indications of their peculiar powers, and experience to a certain extent confirms this supposition. In the vegetable kingdom it has been found, that substances which are insipid and inodorous rarely possess any medicinal virtue, and a number of such substances have been discarded from practice from attention to this circum-

stance; their insipidity having led to suspicion of their activity, and occasioned a more strict examination of the evidence on which their supposed virtues were said to be established. On the other hand, plants possessing much odour or taste, are in general active remedies; and those which resemble each other in these qualities, have often the same general powers: thus astringency is indicated by a styptic taste; bitters are tonic, aromatics are stimulating, and fœtids are usually narcotic.

There are, however, so many causes of obscurity and error in these indications, that they do admit of very extensive accurate application. The different tastes and odours are so little reducible to precise definition or description, that few general rules can be formed from them; and even to the few that have been delivered on this subject, there are many exceptions. The most active vegetable substances, too, have not these properties more peculiar than many others comparatively inert, and hence it is not often that much assistance can be derived from this criterion of the virtues of plants.

The Chemical History of the articles of the Materia Medica forms another important object of investigation.

The opinion seems to have been early adopted by those who cultivated chemistry with a view to its application to medicine, that those substances which act in a similar manner on the living body must be composed of the same principles, and that therefore chemical analysis may be a successful method of investigating their medical virtues,—an opinion not altogether unreasonable. The properties of any compound depend on its chemical composition; they originate from that composition, and are altered by every variation which it suffers. The medicinal powers of such substances must, in common with their other qualities, depend on the same cause; and it is not unreasonable to presume, that where similar powers exist, they arise from similarity of composition, either with regard to the constituent principles, or to the peculiar mode in which these are united.

Confiding in the justness of these conclusions, the chemists, about the beginning of the 17th century, bestowed much labour on the analysis of the different vegetables used in medicine. Above 500 plants were analysed; but this labour led not to a single useful result; and had even the analysis been performed with all those essential precautions which it was impossible that the state of Chemistry at that period could have furnished, the nature of it was such, that it could afford no useful information. The plants subjected to analysis were exposed to heat, and the products collected; but as these products do not pre-exist in the vegetable, but are formed by new combinations of its elements, and as these elements are all in vegetables nearly the same, no connection can be traced between them and the qualities of the substance from which they are obtained. It was found, accordingly, that the most inert and the most poisonous vegetables afforded the same products; and if the experiment were now to be repeated with all the advantages of the rigorous methods of Modern Chemistry, no information of any value to the physician would be obtained. Similar proximate principles of different plants, though possessed of different medicinal powers, would give similar results; or if any difference were observed, it would be impossible to connect this with the difference in their powers. Nor can we expect, from the chemistry at least of our times, to be able to discover on what chemical principle, or what peculiarity of combination, the medicinal virtues of any active vegetable depend; for although these, in common with other

qualities, may arise from chemical composition, yet the varieties of combination, from which they derive their origin, are too minute to be detected by our modes of analysis.

The pretensions of Modern Chemistry, as applied to Materia Medica, are more limited, but they are also more just. By discovering these proximate principles of vegetables in which their active powers reside, and enabling us to separate them from each other, or from inert matter with which they may be mixed, it allows us to apply them with much more advantage; it determines how far in every case such operations are useful: whether the principles thus operated on are altered by these operations, and by what means such alterations, if injurious, may be obviated. Similar advantages are obtained from its application to the few products of the animal kingdom that are employed in medicine. And those belonging to the mineral kingdom can be used with much more advantage and discrimination, when their nature has been ascertained by analysis, than when we are left to collect their virtues from experience.

By the combinations which Chemistry regulates, it furnishes us with many remedies which owe to these combinations their sole power, and which are equally active with many of those afforded by nature. Lastly, it has taught us the proper methods of administering these substances. Many of them exert a mutual action, combine together, or decompose each other; and were such facts which Chemistry discovers not precisely known, important errors would frequently be committed in their mixture and administration.

The last object in the study of the Materia Medica, that to which the others are subservient, is their MEDICAL HISTORY, or the investigation of the virtues and uses of remedies. This comprehends several important subjects of inquiry.

There belongs to it the consideration of the action of these substances on the system, both in its healthy and morbid condition. When the action of any substance in a state of health is ascertained, this leads to its application to the treatment of disease. It may in general be affirmed, though the principle is not without exception, that substances which do not act sensibly on the body in a healthy state, will not prove active remedies; and that, on the contrary, every substance which is capable of producing any important change in the system, must be more or less extensively adapted to the removal of morbid affections. The kind of change, too, indicates the morbid state it is calculated to remove; though sometimes the virtues of remedies are not capable of being inferred from their obvious effects, but are discovered only by their employment from accident, or suggested by analogy, in actual disease.

Another subject of inquiry, scarcely less important, relates to the mode in which remedies act, and by which they produce their peculiar effects. It is not sufficient merely to have ascertained, by the evidence of experience, the virtues of certain remedies in certain cases. It is of importance, farther, to arrange the facts thus collected: to institute some comparison between remedies possessed of nearly the same general power, and, so far as can be done, to investigate their mode of operation, with the view of extending their application by just analogies, and of administering them with more precision.

Lastly, with regard to what may be more strictly termed the medicinal powers of remedies, there are several subjects of consideration of importance. It is necessary to take notice of the applications for which

each individual article is distinguished,—the forms of disease to which it is adapted,—the circumstances that may influence its operation, or may in certain cases render its exhibition doubtful or improper,—the cautions necessary in its use,—the dose in which it is given,—the usual and proper forms of exhibition; and the effects of the combinations of remedies with each other.

These observations point out the subjects to which the attention is principally to be directed in the study of the articles of the Materia Medica.

Very different systems have been followed, according to which these substances are arranged. Two methods are superior to the others, and are possessed of undoubted advantages,—one in which the classification is founded on the natural distinctions of the substances arranged, the other in which it rests on their medicinal powers.

The latter classification appears more systematic, and more conformable to the object of the study itself, than any other. These substances are subjects of inquiry, from being possessed of certain medicinal properties: they ought to be classed, therefore, it might be concluded, on principles conformable to this: and by founding the classification on this basis, some important advantages are obtained; we are enabled to place together the remedies which are possessed of similar virtues,—to deliver the theory of their operation,—to compare the powers of the individual substances arranged under the class; and by a reference to this generalization, to point out more distinctly their degrees of activity, and the peculiarities which may attend the operation of each.

The principal difficulty which attends it, is one arising perhaps from our imperfect knowledge of the laws of the animal economy, and of the operation of remedies, in consequence of which, we cannot always assign their primary action but are often under the necessity of arranging them from their more obvious, though secondary effects. Hence, as many substances are capable of producing various effects of this kind, and are employed in medicine to obtain this diversity of effect, the same substance frequently requires to be considered under different classes, and under each its history is incomplete. It may be capable of acting, for example, as an emetic, as a cathartic, and as a diuretic: did we know precisely the primary operation of it, whence these effects arise, this might serve as the basis of its classification; but this being unknown, and the classification being established on these secondary operations, it must necessarily be placed under each of these classes, and under each its history is imperfect, as it must be limited to the operation which gives the character of the class under which it is arranged.

In a course of lectures this is inconvenient; the history of many important articles of the Materia Medica, being placed under different divisions frequently remote from each other. But in a treatise, to the different parts of which it is easy to refer, it is of less importance, and is more than compensated for, by the other advantages of which this method of classification is possessed. And when the merits of two modes of classification are so nearly balanced, it is even of importance to exhibit the subjects connected with them under the points of view which each mode more peculiarly affords. Though I have adopted, therefore, the one of these modes in my course of lectures, I have thought it preferable to follow the other in the present work.

CHAP. II.

GENERAL VIEW OF THE OPERATIONS OF MEDICINES AND OF THEIR CLASSIFICATION FOUNDED ON THESE OPERATIONS.

The advantages of an arrangement of the articles of the Materia Medica, founded on their medicinal operations, I have stated under the preceding observations; and in endeavouring to exhibit this branch of medicine strictly as a science, it is that undoubtedly which ought to be followed. The difficulty of executing such an arrangement, has at the same time always been experienced. No subject is involved in greater obscurity, than what relates to the action of substances on the living system. Their effects are not always easily appreciated with accuracy, especially in a state of disease, and our knowledge of the laws of their action is extremely imperfect. When we attempt, therefore, to class them according to these actions, we can scarcely form an arrangement strictly just and systematic, but are forced to admit of some deviations, and to be guided not unfrequently by imperfect analogies.

The difficulty of constructing a classification of medicines from their operations, will be apparent from the failure even of Cullen, when he attempted its execution; for there can be little hesitation in affirming that the one he has given rests on principles nearly altogether false. The following table exhibits this classification.

MEDICAMENTA AGUNT IN

- Fluida.
  - Evacuantia.
    - *Errhina.*
    - *Sialogoga.*
    - *Expectorantia.*
    - *Emetica.*
    - *Cathartica.*
    - *Diuretica.*
    - *Diaphoretica.*
    - *Menagoga.*
  - Immutantia.
    - Fluiditatem.
      - *Attenuantia.*
      - *Inspissantia.*
    - Misturam.
      - Acrimoniam corrigentia.
        - In genere.
          - *Demulcentia.*
        - In specie.
          - *Antacida.*
          - *Antalkalina.*
          - *Antiseptica.*
- Solida.
  - Simplicia.
    - *Astringentia.*
    - *Tonica.*
    - *Emollientia.*
    - *Erodentia.*
  - Viva.
    - *Stimulantia.*
    - *Sedantia.*
      - *Narcotica.*
      - *Refrigerantia.*
    - *Antispasmodica.*

Now, without examining it minutely, it may be remarked, that the basis of this classification, the assumption that some medicines act exclusively on the fluids of the body, is incorrect; for, with the exception of two or three classes, the action of the whole is on the living solids. Emetics, cathartics, diuretics, diaphoretics, emmenagogues, expectorants, sialogogues, and errhines, which Cullen has placed as medicines acting on the fluids, produce their effects, unquestionably by no operation on the fluids which they evacuate, but by exciting particular organs to action. The distinction is equally nugatory, in the greater number of cases, between the action of

medicines on the simple solids and on the living solids. It cannot be doubted but that tonics produce their effects in removing debility, not, as the classification of Cullen assumes, by any action on the inanimate fibre of the body, giving it density or tone, but by their operation on the vital powers of the system. Nor can the effects of astringents be ascribed entirely to their corrugating quality.

In this arrangement too, are placed classes of medicines which have probably no existence, the action ascribed to them being merely hypothetical. We may be allowed to question the existence of attenuants and inspissants,—medicines which render the fluids of the body more thin, or which produce the opposite effect. Nor is there any reason to believe in the reality of antiseptics. The process of putrefaction probably never takes place in the living body; and if it did, we know of no specific medicines by which it could be retarded or counteracted.

In the system of Brown, advanced in opposition to that of Cullen, more just views were unquestionably given of the relations of external agents to the living system, and of the laws regulating their action. The operations of medicines, however, are even in this system imperfectly explained, partly from the imperfect state of the science, and partly from its author having surveyed his subject with those views of generalization which preclude minute distinctions. Medicines he supposed to operate merely as other external agents, by exciting to action either the general system, or the particular organs on which they operate; and to differ from each other in little more than in the degree in which they exert this stimulating power. They have, farther than this, no specific properties, but are adapted to the removal of morbid affections, by producing excitement, partial or general, with certain degrees of rapidity or force.

This proposition is far from being just, at least, in an unlimited sense. Medicines, and even external agents in general, unquestionably differ, not only in degree, but in kind of action. Every substance applied to the organs of sense, gives a different sensation, not referrible to the mere force of the impression, but which must be attributed to some essential varieties in the modes of action of the agents themselves. Every organ is excited to its usual or healthy action only by its appropriate stimulant. It is the same with regard to medicines, differences in the kind of action they exert being not less conspicuous. Opium and mercury both excite the actions of the system, and so far they agree in their general operation. But the ultimate effects they produce are extremely dissimilar; nor from either of them can we, by any variation of dose, or mode of administration, obtain those effects which usually result from the action of the other. All the important articles nearly of the Materia Medica might be brought forward as similar examples, and as proving, that they are not to be regarded simply as stimulants varying in strength, but that their action is modified by peculiar powers they exert.

Still the principles of this system approach to the truth, and appear most conformable to the laws which regulate the animal economy, and, with some modifications, they may be applied so as to afford a more satisfactory view of the operations of medicines, as well as a basis for arranging them under different classes.

The general operation of medicines, is that of exciting to action, either the whole system or particular organs. This is the primary effect; and to express the agency of the substance producing it, the term of stimulant operation may be employed. And, according to the kind and degree

of this, different effects are produced, the discrimination of which may afford several important distinctions.

Thus, of those stimulants which act on the general system, the operation is extremely different with regard to diffusibility and permanence. Some are highly diffusible in their action, or, soon after they have been received into the stomach, they produce increased vigour, which is immediately conspicuous in the force of the circulation, the nervous system, or the different functions of the body; while, with regard to others, the same general effect is produced more slowly, and is scarcely perceptible but from their repeated or continued administration. Those which are diffusible are at the same time usually transient in their operation; while those which produce excitement more slowly, are generally more permanent. And by both diversities of action, it is obvious their operation must be productive of very different effects; the high excitement produced by the one, is soon followed by proportional languor; the gradual excitement from the other being reduced more slowly, they occasion no such sudden changes, but are fitted to produce more lasting effects. These varieties of action serve, accordingly, to explain the differences in the power of some of our most important medicines, and they afford the distinction of two principal classes, Narcotics and Tonics; the one, so far as their action is understood, being apparently general stimulants, diffusible and transient, the other slow and permanent.

Another important difference among stimulants is derived from the action of some being general with regard to the system, while that of others is more peculiarly directed to particular organs. The effect with regard to either is not easily explained; but the fact is certain, that some substances, as soon as they are received into the stomach, not only produce on it a stimulant effect, but extend this to the general system; while there are others which, without any very evident action on the stomach, still less without any general action, excite particular organs: some, for example, stimulating the intestinal canal, others exciting the action of the secreting vessels of the kidneys, others operating on the exhalent vessels of the skin. These afford the distinctions of cathartics, diuretics, and diaphoretics, and there are other classes founded on similar local operations. With this local action, many substances exert, at the same time, more or less of a general operation, by which the individuals of a class become capable of producing peculiar effects, and many of them, by peculiarity of administration, act specifically on more than one part of the system, by which their effects are still more diversified.

When medicines are thus determined to particular parts, they are either directly conveyed, by being received into the blood, or their action is communicated indirectly from the stomach by the medium of the nervous system; and in both ways important local effects are produced.

Thus, there are many substances which appear to be capable of being so far assimilated with the food, as to enter into the composition of the chyle, and are received into the circulating mass. Being brought, in the course of the circulation, to particular organs, they often excite in them peculiar actions. Mercury affords an example of this. It enters the circulation, and, when accumulated to a sufficient extent, generally acts on the salivary glands. It is on secreting organs that these local effects are usually produced, and frequently the substance is separated with the secreted fluid, so as to act on the secreting vessels. Such is the case with the alkaline salts, or with nitre, which are secreted by the vessels

of the kidneys, stimulate them at the same time to increased action, and are capable of being detected in the urine by chemical tests.

But the most general mode in which the operation of medicines taken into the stomach is extended, either to the system in general, or to any particular organ, is by the medium of nervous communication. An impression is made on the fibres of the stomach by the substance received into it; and, however difficult it may be to conceive the mode in which this can be communicated by the nerves to distant parts, the fact is established by sufficient evidence. It is evident from the effects of these substances being produced in a shorter time after they have been received into the stomach, than they could be were they to act by being absorbed by the chyle into the circulating mass. The stimulus of wine or of opium received into the stomach, will instantly remove lassitude, and increase the vigour of the circulation, or of muscular exertion; or the same substances, in a larger dose, will, with the same celerity, depress all the functions and exhaust the powers of life. Digitalis given to sufficient extent will speedily reduce, to a great degree, the frequency of the pulse; or a large dose of cinchona, given half an hour before the excepted recurrence of the paroxysm of an intermittent, will prevent its attack. It has also been proved by experiment, that this communication of action from the stomach to other parts, in a number of cases, does not take place where the brain and spinal marrow have been destroyed, though the heart and vascular system have been preserved uninjured.

From this susceptibility of impression and of communicating action to other parts, the stomach becomes an organ of the first importance, since, independent of its being the vehicle by which substances are conveyed into the blood, it is that by means of which medicines are brought to act on the system by the medium of the nerves. It sometimes happens, however. that a similar extension of action may take place from other parts; and hence effects may be obtained from medicines, by applying them to the surface of the body, similar to those which they produce when they have been received into the stomach. Sometimes the effect is conveyed by nervous communication, and sometimes the substance applied is absorbed by the lymphatics, and enters the blood. Examples of the first are to be found in many narcotics. Opium, applied to the skin, either in the solid form, or in that of tincture, often relieves pain, and removes spasmodic affections, either general or local. Tobacco applied to the region of the stomach excites vomiting; and garlic applied to the feet acts as a powerful stimulant, and raises the strength of the pulse. Examples of the second mode of operation are still more frequent. Friction on the surface is a common method of introducing mercury into the circulating mass. By the same means oxide of arsenic, tartrate of antimony, and other active substances, may be introduced; a solution of them in water being rubbed on the palms of the hand; and under certain circumstances, this is preferable to their administration by the stomach. Many substances applied to a wound, produce important effects on the system, affecting the functions of the heart or brain: in such cases they appear to act by entering the circulation through the divided veins of the part to which they are applied.

These are examples of the various relations which medicines bear to the living system. We are unable to assign a cause for these peculiar properties, to ascertain why the action of some should be extended to

the system in general, or why that of others should be determined to particular parts, either where substances enter the blood, or where they act by the medium of the nerves. But from the possession of properties it is evident, that their powers as medicines must be more diversified than if they were merely general stimulants, varying in the degree of their stimulating power; and farther, that distinctions are thus afforded for establishing a variety of classes.

Another cause remains to be pointed out, by which the actions of medicines are diversified. Besides acting as stimulants, they sometimes occasion changes, either mechanical or chemical, in the state of the fluids, or of the simple solids, and these changes are productive of medicinal effects.

This operation of medicines was formerly supposed to be more extensive than it really is. Sufficient weight was not allowed to the important fact that the actions of external agents on the living body are governed by laws different from those which regulate the actions exerted between the masses or particles of inanimate matter. Hence we find, in medical speculations, constant attempts to trace the causes of diseases to changes merely mechanical or chemical, to plethora or obstruction, to laxity or rigidity, to the abundance of acid or of alkali, or to the presence of other specific acrimonies still less defined. The explanations of the operations of medicines were of course founded on these notions, and hence the distinctions of inspissants, attenuants, antacids, antalkalies, antiseptics, and several others with which the Materia Medica was loaded.

These errors are now nearly exploded. We have learned to consider the living system as endowed with peculiar properties and modes of action, incapable of being explained on mere mechanical or chemical principles; and to regard external powers acting upon it as producing changes conformable to these peculiar properties of life. Yet still we can sometimes refer a salutary change, either general or partial, to changes mechanical or chemical in the solids or fluids. Thus, symptoms arising from irritation may be removed by lubricating the irritated surface; acid in the stomach may be corrected by the exhibition of alkalies or absorbent earths; and urinary concretions may be dissolved, or at least their increase may be prevented, by the use of alkaline remedies. These properties of certain medicines are not perhaps highly important; but they demand attention, and they afford sufficient distinctions for the formation of several classes.

In conformity to these views, the classification of the articles of the Materia Medica, founded on their medicinal operations, may be established. It is only necessary to observe, principally to obviate hasty criticism, that in classifications founded on this principle, perfect precision is not to be expected. The science of medicine is still in so imperfect a state, particularly in what regards the relations of external agents to the living body, that both in arranging the class, and associating the substances which we place under each, we must frequently rest satisfied with remote analogies, which will not always bear a strict examination. This is an imperfection at present unavoidable; it must either be submitted to, or such modes of classification must be altogether rejected; and the question therefore ultimately is, not whether these arrangements are unobjectionable, but whether the advantages belonging to them are not such as to satisfy their adoption even with their imperfections.

Under the first division of the arrangement I propose, may be placed those substances which exert a general stimulant operation on the system.

Of these there are two subdivisions, the Diffusible and the Permanent; the former including the class of Narcotics, with which may be associated, as not very remote in their operation, the class of Antispasmodics; the latter comprising two classes, Tonics and Astringents. Through these there is a gradual transition from the more highly diffusible stimulants, to those more slow and durable in their action.

A second division comprehends Local Stimulants—those, the action of which is determined to particular parts of the system. Such are the classes of Emetics, Cathartics, Emmenagogues, Diuretics, Diaphoretics, Expectorants, and Sialogogues; with which may be associated the classes of Errhines, and of Epispastics, founded on direct local application.

The remaining classes include substances which do not operate according to laws peculiar to the living system. To one division may be referred those, the effects of which depend on the chemical changes they produce in the fluids or solids: the classes which may be established on this principle are Refrigerants, Antacids, Lithontriptics, and Escharotics. To another division belong those, the operation of which is purely mechanical,—Diluents, Demulcents, Emollients, and Anthelmintics.

Under these classes may be comprehended all those substances which are capable of producing salutary changes in the human system, and which are used as remedies. A view of this classification is exhibited in the following table:

TABLE OF CLASSIFICATION.

A. General Stimulants.

a. Diffusible.	Narcotics. Antispasmodics.	b. Permanent.	Tonics. Astringents.

B. Local Stimulants.

Emetics.	Diuretics.	Sialogogues.
Cathartics.	Diaphoretics.	Errhines.
Emmenagogues.	Expectorants.	Epispastics.

C. Chemical Remedies.

Escharotics.	Antacids.	Lithontriptics.	Refrigerants.

D. Mechanical Remedies.

Diluents.	Demulcents.	Emollients.	Anthelmintics.

From this arrangement, some classes are excluded that have usually found a place in others; but these have either appeared to me to be not essentially different from those that are admitted, or to have been founded on false or hypothetical distinctions.

There is no great advantage in extending the arrangement in systematic subdivisions of the classes. The substances under each may follow each other according to their natural affinities, their chemical relations, or analogies in medicinal power less important than those which form the basis of the class itself; and in the different classes, one of those methods will frequently be found better adapted to any purpose of utility than the others. That which gives the most natural and useful arrangement may therefore always be followed.

There are some substances which it is of peculiar advantage to consider together, instead of placing under different classes, to which, when

arranged according to their medicinal operations, they belong: such are Mineral Waters and the Gases. These I have placed in an Appendix at the end of the second volume.

ADDITIONAL OBSERVATIONS

ON THE OPERATION OF MEDICINES.

(BY THE EDITOR.)

[There are at present two theories more especially prevalent in this country concerning the modus operandi of medicines. The first asserts that all medicinal substances act primarily and exclusively upon the solids of the body, and that all the consequent impressions made upon distant parts of the system are the result of *sympathy*. This theory of course rejects entirely the fluids as having any immediate concern in the operation of medicines, and even denies as a matter of fact that foreign substances of any kind ever enter into the living circulation. The second, while it admits the existence of such a principle or property as sympathy, by whose agency the operation of a certain portion of medicines can alone be explained, contends at the same time that other medicines act directly upon the fluids, are absorbed into the circulation, and produce effects upon the system at large as well as upon particular organs through the medium of the blood. Among the advocates of the former of these theories is professor Chapman of Philadelphia, who, it must be admitted, has displayed abundance of zeal, if not of judgment, in its support. As his work on Materia Medica and Therapeutics may be considered as embodying the whole strength of the supporters of this doctrine, I shall take the liberty of examining some of the principal arguments upon which its defence is rested. In announcing his views on this subject, Doctor Chapman asserts that "all medicines act by exciting a local impression, which is extended through the medium of sympathy."—vol. i. p. 60. 2d. Ed.

As a corollary from this position, he denies that any substances ever enter the circulation. "It must be acknowledged," says he, "that no substance, in its active state, does reach the circulation, since it is shown, that a small portion even of the mildest fluid, as milk or mucilage, oil or pus, cannot be injected into the blood-vessels, without occasioning the most fatal consequences."—vol. i. p. 64.

A prominent argument in support of this opinion, and one which seems to be dwelt upon with considerable complacency, is, "that chyle, however diversified the materials may be out of which it is formed, whether animal or vegetable, has essentially an identity of nature. This "fact of the perfect and uniform constitution of chyle seems, at once," it is said, "to put down the hypothesis" that any crude substances are ever taken into the circulation. Now, against this argument I would interpose one or two objections. It does not appear, in the first place, to be really the fact, that chyle, whether formed from animal or vegetable food, possesses this "perfect uniformity and identity of constitution," for which Dr. Chapman contends. So far from this, the very reverse has been completely established by actual experiment. Dr. Mar-

cet, in his analysis of chyle,* states that the chyle from vegetable food yields about three times as much charcoal as that from animal food; that the chyle from animal food generally begins to putrefy in three or four days, whilst that from vegetable food can be kept for weeks, or even months, without undergoing putrefaction; that the chyle from animal food is always milky, and on standing, an unctuous white creamy substance collects on the surface; its coagulum is opaque, and has a pink hue; the chyle from vegetable food is commonly transparent, or nearly so, like common serum; its coagulum is nearly colourless, like an oyster, and no creamy substance rises to the surface. This statement certainly exhibits several very striking points of difference between the chyle formed from animal food, and that formed from vegetables; and it unquestionably does away the broad position concerning the "perfect uniformity" of chyle. Should Dr. Chapman endeavour to shield himself from the force of this representation, by urging that the difference pointed out in the analysis of Dr. Marcet is merely a variation in the proportions of the same elementary ingredients, his own work may be referred to for a summary refutation of such a suggestion, when he tells us, "that experiments have fully demonstrated, that articles widely discrepant in their general nature, as aliment and medicines, the most salutary food, and the rankest poison, exhibit, on analysis, nearly the same results. This indeed holds so generally true, that the virus of the viper, and the mildest mucilage, the poisonous prussic acid, and the nutritive flesh of animals, constitute no exception. Decomposed into their elementary principles, they are essentially the same."—vol. i. p. 42. If, therefore, a variation in the proportions and combinations of its elementary ingredients does not constitute a real difference in the chyle, then it follows from Dr. Chapman's own showing, that there is no difference between "aliments and medicines"—between "the most salutary food and the rankest poison"—between "the virus of the viper, and the mildest mucilage"—or between "the poisonous prussic acid, and the nutritive flesh of animals."

A second objection to this doctrine of the "perfect and uniform identity" of chyle, is, that it is positively contradicted by facts too well attested to be set aside. By Musgrave, Fordyce, and others, it has long since been shown, that certain articles, taken into the stomach with the food, will impart their peculiar colour to the chyle, and must therefore have become incorporated with it. By Dr. Chapman this is denied, on the ground of experiments made by himself and others, in the University of Pennsylvania, although he appears not to be borne out in his conclusions, even by his own statement. "None of the preparations of iron," he tells us, "of copper, of lead, nor the colouring matter of indigo, of madder, or of rhubarb, can be traced even as far as the chyle. Being introduced into the small intestines of dogs, *these several articles were observed to be rapidly taken up by the lacteals*, the coloured ones losing their tints on passing on, and, in every instance, so completely were their properties obliterated, as not at all to be cognizable by any chemical tests in the contents of the thoracic duct."—vol. i. p. 68.

Dr. Chapman will not pretend that the lacteals contain any other fluid than the *chyle*, and if so, he upsets his whole argument by the admissions which he makes in the paragraph just quoted. The fact that the chyle, when it reached the thoracic duct, had lost the colour impart-

* Medico-Chirurgical Transactions, vol. vi. p. 630.

ed to it by the various substances mentioned in these experiments may be explained in a very simple and satisfactory manner, by recollecting that as the indigo or the madder passed on from the lacteals to the thoracic duct, it became successively diffused through a larger quantity of chyle, and therefore it was a very obvious and necessary consequence that the colour communicated to the chyle should become constantly fainter, until finally it was completely lost. A satisfactory illustration is at the command of every person. By dissolving a portion of indigo in a small quantity of milk or water, it will be found to give to these fluids a very deep tinge. By adding successively however of the milk or water, the colour will gradually fade, until at last it will be scarcely perceptible. Precisely in this way is the fact mentioned by Dr. Chapman to be explained.

A *second* argument of Dr. Chapman's against the doctrine that medicinal substances are taken into the circulation, is, that if such were the case, it would be attended with the most fatal effects upon the system, inasmuch as the mildest fluids cannot be injected into the blood-vessels without destroying life. That his reasoning may be perfectly understood, I shall quote his own language; "It must be acknowledged," says he, "that no substance, in its active state, does reach the circulation, since it is shown, that a small portion even of the midest fluid, as milk or mucilage, oil or pus, cannot be injected into the blood-vessels, without occasioning the most fatal consequences. Twenty-two years ago, in conjunction with my friend, the late Dr. George Lee, then resident in the Pennsylvania Hospital, I instituted a series of experiments to this purpose. All the articles enumerated above were tried in succession, together with some others of an acrid and stimulating nature, on dogs and cats, the animals selected on the occasion. But, diversified as these substances are, we could discern no material difference in their effects, the whole seeming to act merely as extraneous matter in *error loci*, producing, at first, great distress to the animal, as was indicated by its movements and cries, followed by difficult panting, respiration, vomiting, and purging, nervous tremors, convulsions, and death. Experiments very analogous to the preceding have recently, I understand, been made by Professor Caldwell, and with confirmatory results. That the late inquiries of Sir Everard Home and others lead to a different conclusion, I am aware. Confiding, however, in the accuracy of our own observations, I must, in the present state of the question, still maintain, without the slightest qualification, the position I have assumed."—vol. i. p. 64, 65.

Before proceeding to the examination of this argument, I cannot help expressing my regret that the experiments to which Dr. Chapman alludes, as having been performed in Philadelphia, should differ so widely from those conducted in other parts of the world, because it serves not merely to shake the confidence hitherto reposed in men who have been universally esteemed as able and accurate experimentalists, but also to weaken the faith which might otherwise have been put in the accuracy of the experiments of Dr. Chapman himself. For assuredly, if Home, Majendie, and others, who have devoted their lives to these investigations, are not to be depended upon, it cannot be considered as very presumptuous to cherish a little scepticism concerning the infallibility of Dr. Chapman or Dr. Caldwell. Without intending however to impeach in the least the correctness of the experiments of either of these gentlemen, it is impossible to get rid of the mass of opposite testimony, recorded on authority too respectable to be despised. Independent of those reported by Home

and Majendie, there are many other facts to prove, that medicines introduced into the blood-vessels may prove not merely innocuous, but even salutary. By referring to some of the early volumes of the Transactions of the Royal Society in London, several cases will be found recorded, in which patients were cured by medicines thus introduced into the system. Admitting, however, for the sake of argument, the objection of Dr. Chapman to its fullest extent, it by no means proves the doctrine for which he contends. Supposing that medicinal substances, when injected into the blood-vessels, do produce such deleterious effects, it does not seem of necessity to follow, that similar consequences should result from them, when introduced into the circulation through the medium of the stomach and lacteals. On the contrary, the difference in the two modes of introduction seems so great as really to destroy all analogy between them. In proof of this, it need only to be mentioned, that the chyle, the natural fluid circulating through the lacteals, will, if injected into any of the blood-vessels, produce effects precisely similar, and equally injurious with any of the foreign substances alluded to by Dr. Chapman. Hence, the conclusion is inevitable, that substances may pass innocently into the system through *the lacteals* which would be succeeded by the most deleterious consequences if introduced directly into *the blood*. And if so, Dr. Chapman's argument falls at once to the ground. It were easy to enlarge, for the purpose of showing how wide a difference there is in the *manner* in which substances enter the circulation in the two cases, but this must be so obvious to every person of reflection, that it is unnecessary to add any thing further on the subject.

A *third* objection of Dr. Chapman is couched in the following language: "Conceding, however, to the humoral pathologists all that their doctrine demands, still *insuperable difficulties* remain in the way of its adoption, to account for the operation of medicines. Not to dwell tediously on the subject, I shall content myself, at present, with little more than mentioning, that we are not at all informed by it, why our remedies, after mixing with the blood, should be directed to one organ in preference to another, as mercury to the salivary glands, or how indeed they operate at all."—vol. i. p. 65. It is impossible to conjecture what Dr. Chapman gains by this objection, for it applies with quite as much force to his own theory. He tells us indeed that medicines are directed to particular parts of the system "through the medium of sympathy;" at the same time confessing that "of the *manner* in which impressions are extended, as well as of the *cause* of the more intimate consent of parts, we are not, perhaps, accurately informed." If, therefore, Dr. Chapman's own theory is confessedly inadequate to the explanation of this phenomenon, I have yet to learn by what rule of sound logic he is justified in raising this objection against another theory.

After all I cannot see any of those "insuperable difficulties," in explaining this subject, which appear to weigh so much upon the mind of Dr. Chapman. That every organ in the body has its peculiar and appropriate stimulus, by which it is excited into action, is so universally admitted as to require no process of reasoning to establish it. Dr. Chapman himself concedes it, and indeed it forms the basis of his classification. Hence it follows that certain medicines when introduced into the system, act upon particular organs, leaving the rest more or less unaffected. If this be so, then there can be little difficulty in conceiving that a substance dissolved in the blood may circulate through the system, without producing any particular effects, until it reaches the organs upon which, from its

peculiar properties, it is designed to operate. The reason *why* a medicine acts upon one organ, in preference to all the other organs of the body, why jalap, for instance, operates upon the intestines and not upon the brain and lungs, we can no more explain than we can the reason *why* the planets are kept revolving in their orbits. If we are told that the movements of the planets are the result of attraction, so we may say that the determination of medicines to certain organs is occasioned by a similar kind of attraction. This however explains nothing, and we must after all be content with the broad *fact*, that such phenomena do occur, and that they are governed by certain laws; but the *cause why* they occur must ever remain concealed. Upon this ground Dr. Chapman is certainly asking too much to require that the cause should be assigned "*why* remedies, after mixing with the blood, should be directed to one organ in preference to another." All that the most rigid disputant can reasonably demand or expect is, that it should be proved in the first place, that medicines are actually taken up into the circulation; and in the second place, that they afterwards act upon particular parts of the system. The latter is admitted on all hands, and the former rests on proofs too solid to be shaken.

A *fourth* objection is, that "by the *medication* of the blood, were it possible, as is contended for, we must in all instances do harm. The whole mass of circulating fluids is equally charged in this case with the medicinal substance, and therefore, while an action is going on in a diseased organ, which may be salutary as to it, every sound part of the system becomes subjected to a similar impression, which could not fail to disturb the order of health, and create morbid derangements."—vol. i. p. 65, 66.

All this is purely hypothetical. It is founded on a supposition entirely erroneous, which is, that a medicine cannot act upon one part of the system to the exclusion of the rest. In what has already been urged I have in fact so fully replied to this argument, that it is unnecessary to enter into any recapitulation.

I have thus considered all the material objections of Dr. Chapman, against what he chooses to call "a relick of the humoral pathology." Aware of the strong support which this "relick" receives from indisputable facts, he endeavours to explain them away in a manner equally singular and original. That we may have before us the full scope of his reasoning on this point I shall quote him at length. "That some of the properties of certain articles are displayed," says he, "in the secretions and excretions, I am not disposed to deny. But it does not hence follow, that these substances entered the circulation in the primitive state. Directly the reverse, indeed, seems to be proved, as no one of them can be detected in the serum of the blood. To me it is clear, that the process of assimilation, as performed either by the chylopoietic viscera, or by any part of the absorbent apparatus, completely *decomposes* all substances; and however discrepant in their properties, reduces them to a homogeneous fluid fitted for the purpose of nutrition. But, when thrown into the secretions or excretions, being removed beyond the control of the vital energies, chemical affinities are sometimes again brought into play, by which these substances are in part, or wholly regenerated. No slender support is given to this hypothesis by the well-known fact, that matters are found in such persons, which had not previously existed, in any cognizable state, in the blood. Thus, certain articles can only be detected in certain

fluids, as the odour of garlic in milk, of asparagus in urine, of sulphur in the perspiration, and the colouring principle of madder is to be traced in no part of the solids, except the bones, and their immediate appendages, the cartilages. Did these articles pre-exist in the blood, instead of being regenerated in some such manner as I stated, ought they not to be thrown out indiscriminately by all the emunctories ?"—vol. i. p. 63, 64.

The most sturdy of the humoral pathologists could not wish Dr. Chapman to concede more than he has actually done in the foregoing paragraph. He admits that certain substances are carried into the circulation, and that they display their peculiar properties in the secretions and excretions. But, says he, they do not enter the circulation " in their primitive state ;" they are reduced by the " process of assimilation," and thus enter into the circulation, and when thrown into the secretions and excretions, by the " play of chemical affinities, they are again, wholly or in part, regenerated." Let us analyse this explanation, and see what it amounts to. We are told that sulphur, taken internally, exhibits itself in the perspiration. According to Dr. Chapman's solution of this fact, the sulphur, before it is taken into the circulation, is reduced in some way, so as to deprive it of all its characteristic properties, and when thrown out upon the skin by the "play of chemical affinities," is again regenerated and exhibited in the form of sulphur. To this explanation, objections of so strong and obvious a character present themselves, as to render it wholly inadmissible. We know nothing of sulphur, but as a *simple* substance, and Dr. Chapman ought to prove that it is *capable* of decomposition, before his explanation will hold good. Let us take another illustration. Nitrate of silver, taken internally, frequently produces permanent discolouration of the skin. Cases of this kind are on record,* and it is presumed will not be disputed. Dr. Chapman would argue, that the nitrate of silver is first decomposed into its elementary ingredients, and afterwards regenerated on the surface. The nitrate of silver then would be decomposed into nitric acid, and an oxide of silver: the nitric acid again would then be decomposed into oxygen and azote; and the oxide of silver into oxygen and the pure metal. Further than this it is impossible to decompose them. Here, then, according to Dr. Chapman's own explanation, we have silver, a large quantity of oxygen, and azote, which must all enter into the blood in their separate and uncompounded state, or else it is impossible for the nitrate of silver to be formed afterwards upon the surface. It is evident, that this solution multiplies the difficulties which it was intended to remove. According to it, instead of *one*, we have actually *three* foreign substances entering into the blood. Dr. Chapman certainly could not have been aware of the consequences of his own doctrine, or he never would have urged it so boldly. Again; the colouring principle of madder, which is found in the bones, Dr. Chapman tells us, is decomposed by the chylopoietic viscera, and again regenerated in the places where it is detected. Now, before this is admitted, it must be proved that this colouring principle is capable of being decomposed. This would be rather a difficult undertaking. Admitting, however, that it might be decomposed, it would be no less difficult to show that it could afterwards be regenerated. Vegetables undergo *destructive* decomposition, and can never be regenerated by the art of the chemist, or by any play of chemical affinities. In every point of view, therefore, the ex-

* See Medico-Chirurgical Transactions of London.

planation of Dr. Chapman is wholly inadmissible; being inconsistent with itself, and contradictory to known and acknowledged principles.

But, says Dr. Chapman, "did these articles pre-exist in the blood, instead of being regenerated in some such manner as I have stated, ought they not to be thrown out indiscriminately by all the emunctories?" I answer no. Such a consequence no more follows than that all the glands of the system should secrete precisely the same kind of fluid. With just as much propriety might it be asked, why the liver does not secrete milk, or why the stomach does not secrete urine. The truth is, every secreting organ is destined to separate from the blood a *peculiar* substance, and hence it is perfectly plain why foreign matters, circulating in the blood, are not "thrown out indiscriminately upon all the emunctories."

Having given his objections to the doctrine that medicines ever enter the circulation, Dr. Chapman proceeds to explain his own theory of the *modus operandi* of medicines.

"It results, on the whole, from what I have said, that we are to reject the fluids altogether in our inquiries relative to the operations of medicines: because, in addition to the reasons already stated for doing so, we have in that law of the animal economy, termed sympathy, or consent of parts, a solution of the problem, which comports infinitely better with the existing state of our knowledge.

Conformably to theory I have adopted, whenever a medicinal substance is applied to a susceptible portion of the body, externally or internally, an action is excited, which is extended more or less, according to the diffusibility of the properties of the substance, or the degree of sympathetic connexion, which the part may maintain with the body generally. Thus a set of actions is raised, every one of which is precisely similar, provided they are confined to the same system, by which is to be understood parts of an identity of structure. If, however, the chain runs into other systems, it loses its homogeneous character, the actions being modified by the peculiar organization of the parts in which they may take place. These are principles of universal application. In every case, whether it respects the operation of remedies, or the production of disease, the spot primarily acted upon, is a point from which is diffused the radiated impressions."—vol. i. p. 70, 71.

It may easily be gathered from the sentiments already expressed, that I do by no means subscribe to this theory. Like most sweeping generalizations, it is altogether too exclusive, and fails to account for the operation of a very large portion of medicinal substances, which seem to act upon a principle entirely different. No better proof of the inadequacy of this theory can be required, than Dr. Chapman's own work. Take, for instance, what he says concerning the Oil of Turpentine. In treating of the virtues of this article in correcting the lithic diathesis, and relieving nephritic pains, he adds, "on what principle it operates is not very intelligible, though it would seem that its appearance in the bladder is necessary to its success. I am told by Dr. Physick, to whom I owe much of the information which I possess on the subject of this article, that whenever it has failed with him, the *violet odour* was wanting in the urine." —vol. i. p. 343. It is very plain that Dr. Chapman here abandons his own theory; for if the doctrine of sympathy could explain the operation of the turpentine, why is he forced to confess that the "principle on which it operates is not very intelligible?" Nothing can be clearer than that sympathy, at least as explained by our author, has nothing to do in

this case. The fact speaks for itself. The turpentine must be taken into the circulation, and afterwards act directly upon the urinary organs, or else the *violet odour* could not be detected in the urine. Here, then, is at least one clear and pointed exception to Dr. Chapman's theory.

Let us take another illustration. In discussing the general action of "Lithontriptics and Antilithics," it is stated that the possibility of dissolving a stone in the bladder by a course of medicine rests upon two grounds, one of which is the following, viz. "that some of these solvents do reach the urinary bladder, without any, or at least, a material change being wrought in their properties, so that when coming in contact with the stone, there might be a play of chemical affinities, and hence a decomposition of the calculous body."—vol. i. p. 322. Now, here is an unqualified admission, of not a *single* medicine, but a *whole class* of medicines acting upon principles purely *chemical*. In so far, therefore, as this class of remedies is concerned, it cuts short the doctrine of sympathy, and proves beyond a doubt, that the unlimited manner in which that doctrine is maintained by Dr. Chapman is wholly untenable. No "sympathetic actions," nor "associated motions," nor "radiated impressions diffused from a point," can ever dissolve a stone in the bladder, or account for the varied appearance of the urine, resulting from the use of internal remedies.

Another exception to Dr. Chapman's theory may be found in the list of Anthelmintic medicines, a large portion of which are admitted to act by their poisonous properties upon the animal. But it is unnecessary to push this subject any further. Enough has been adduced to prove, that the doctrine of sympathy can only be admitted with such large qualifications and exceptions, as to overturn completely the theory that medicines uniformly and universally act upon this principle alone. I hope not to be misunderstood. In explaining the operation of medicines I do by no means deny altogether the agency of sympathy, or some principle very similar to it. To contend that all medicines act through the medium of the circulation would not be less contradictory to reason and fact, than the doctrine which has been combatted. I do not believe in this wonderful simplicity of nature, which has been so favourite an argument with every theorist who has attempted to explain the intricacies of a whole science upon *one* general principle. Dr. Chapman, for instance, tells us, that "to multiply causes superfluously is against one of the fundamental rules of philosophising, and is not less repugnant to the general course of nature, whose means are proverbially distinguished by great simplicity and uniformity." This is true indeed; but then it is equally unphilosophical, not to assign causes *sufficient* to explain known and acknowledged phenomena; and as it regards the present case, it rests with Dr. Chapman to show that by calling in the aid of the circulation we multiply causes unnecessarily. An excessive fondness for simplification has been the bane of medical science. It was this which led Brown to maintain the absurd doctrine that all medicines were stimulants, the only difference between them being in the force and rapidity with which they exercised their stimulating powers. It was this which prompted Dr. Rush to defend the strange notion of the unity of disease, and it is this which induces Dr. Chapman to contend for the exclusive agency of sympathy, in explaining the operations of medicines. Wanting, as they all do, the broad and substantial basis of truth and philosophy upon which to rest, it is impossible that their influence should be other than transient and ephemeral. The theory of Brown has long since been abandoned. The unity of disease, notwith-

standing the zeal, and talents, and eloquence with which it was defended, was falling by its own weight, even before the death of its illustrious author. And it requires not the spirit of prophecy to predict that a similar fate awaits the theory of Dr. Chapman.*—B.]

FIRST DIVISION.—OF GENERAL STIMULANTS.

This division, according to the preceding table of classification, includes the four classes of Narcotics, Antispasmodics, Tonics, and Astringents,—these agreeing in the general stimulant operation they exert on the system, and differing principally in the diffusibility and permanence of action. They are therefore strictly connected, at least so far as to form a series through which the transition is easily traced.

CHAP. III.

NARCOTICA.—NARCOTICS.

Narcotics, according to the definition usually given of them, are substances which diminish the actions and powers of the system, without occasioning any sensible evacuation. This definition is imperfect, inasmuch as it does not include that stimulant operation which the most powerful of them at least equally produce, and which in part must be admitted as the cause of these effects. The term Narcotic is the most unexceptionable that can be assigned to these remedies. They are also named Sedatives, from their tendency to diminish action; Anodynes, from their capability of alleviating pain; and Hypnotics, or Soporifics, from their power of inducing sleep.

The following are their general effects from their operation, selecting, as affording an example of this, the most powerful of the class. In a moderate dose they increase the force and frequency of the pulse, promote the secretions, give vigour to the body, and rouse the faculties of the mind, inducing hilarity or intoxication. These effects are however only temporarary, and after some time symptoms of an opposite kind make their appearance; the pulse not only returns to its former standard, but becomes more slow, and at the same time full and soft; the respiration is more easy; the secretions, excepting that by the skin, are diminished; pain and inordinate motion, if present, are alleviated or depressed: there is a general languor, averseness to motion, and dulness of sense; the mind is placid and inactive; and this state soon terminates in sleep. This, after continuing for some time, is followed by temporary debility, marked by some degree of sickness, tremors, and anxiety. If the dose has been large, these symptoms of diminished sense and action are induced without any previous increased ac-

* It may be proper to state that much of what is contained in the preceding observations appeared originally in the form of a Review of Dr. Chapman's Therapeutics, written by myself, and published in the first Number of the New-York Medical and Physical Journal. *Ed.*

tion ; or, if a still larger dose has been given, the consequences are delirium, paralysis, convulsions, coma, and death.

These effects are diversified, however, as arising from different Narcotics. In some, any stimulant operation is scarcely perceptible in any dose ; others with the narcotic power, possess an acrid quality, and in a large dose, with the general effects, induce irritation or inflammation of the stomach, by which their action is modified. Some are more apt to induce sickness than others ; and there is reason to believe that there are others in which the action is not equal on the nervous and vascular systems, but is more determined to the one than to the other.

The medicines belonging to this class act primarily upon the stomach, whence their action is propagated by nervous communication to the rest of the system. That they do not act by being received into the blood, is evident from the fact, that their effects are apparent in general in a short time after they have been swallowed ; and it has been found on dissection immediately after these effects have appeared, that the whole of the quantity administered has remained in the stomach undissolved.

Applied externally, these medicines often exert their usual action, though with less force. Opium deadens pain, and represses spasmodic muscular action, and this not only in the part to which it is immediately applied, but in others more distant. Several others of the class have similar effects ; and their operation in this mode of application, too, seems to be extended by the medium of the nerves.

Narcotics applied to the muscles of animals, quicken at first their action ; but in a short time they exhaust irritability and sensibility. The heart, even of cold-blooded animals, is deprived of all power of motion by a strong solution of opium applied for a few minutes. When injected into the blood-vessels, the animal instantly dies without convulsions, and all the muscles of the body, voluntary or involuntary, are deprived of the power of contraction. When applied to a wound, they often affect the general system, and in this case they appear to act, by being received through the divided veins into the circulation ; the interposition of a ligature on the blood-vessels preventing the effect.

In the production of the effects arising from the action of Narcotics, the brain seems to be the organ chiefly affected, and it is from this affection that death seems to follow from their operation, the direct action on the heart being much less considerable. This has been more clearly established by the experiments of Mr. Brodie. On introducing alcohol into the stomach of a small animal, or injecting a small quantity of the juice of aconite, or of the essential oil of the bitter almond diffused in water, or of the leaves of tobacco into the rectum, or in a concentrated state into a wound, the loss of voluntary motion, and total insensibility, were produced ; yet when this state was allowed to continue until the external signs of apparent death were produced, the heart, when exposed to view, was found contracting with considerable force, and by inflating the lungs, and producing artificial respiration, its action could be kept up nearly to the natural standard for a considerable period. It appears, therefore, that while the nervous system was so much affected as to produce the cessation of the principal functions dependent on it, the powers of the circulating system were little impaired ; and the failure of the circulation ultimately producing death, appears in such cases to arise principally from the respiration ceasing, in consequence of this function being so much more dependent on the influence of the nevers. The immediate

effects of narcotics arise, therefore, from affection of the functions of the brain: the function of respiration is affected in consequence of this, and at length ceases, and this occasions, or at least accelerates, the failure of the circulation, which produces death. From this an important conclusion follows. In the case of insensibility produced by the operation of a narcotic, as the heart continues to act, it is possible, that if the cessation of its action be prevented by keeping up respiration artificially, the affection of the brain may pass off, and the functions of life be restored. Mr. Brodie has stated some striking experiments in proof of this. In a rabbit, the state of total insensibility was induced by a drop of the essential oil of bitter almond inserted into a wound; after five minutes, respiration had ceased; the heart was left beating through the ribs, but its motion must have soon ceased, and life been extinguished: artificial respiration was excited, in six minutes the animal moved and made an effort to breathe; these efforts were repeated; after sixteen minutes, the artificial respiration was discontinued, spontaneous respiration being established, all the functions revived, and in two hours the animal appeared to be perfectly well. In another case, the animal recovered from a state of insensibility, after artificial respiration had been continued for nearly three hours. From these facts, the preventing the failure of respiration, and the exciting it, if necessary, artificially, at the same time keeping up the proper animal temperature, would appear to be important indications in the extreme state of exhaustion occasioned by the operation of a narcotic, such as alcohol or opium.

There are some narcotics which operate with more force on the muscular fibre, and directly affect the heart. The infusion of tobacco injected into the intestines, occasions immediate loss of motion and sensibility, and the heart, instead of continuing to contract, was found by Mr. Brodie to have ceased contracting, and to be distended with blood. The poison of the *upas antiar* has a similar effect: but what is singular, the distilled oil of tobacco does not act like the infusion, but like other narcotics.

The theory of the operation of narcotics is attended with considerable difficulty, and very different opinions have been maintained with regard to it.

As they in general diminish the actions of the system when given even in a small dose, their primary action was considered as of a depressing kind, and they were described by authors under the appellation of Sedatives. The stimulant effects which were observed sometimes to arise from their action, were ascribed to what was termed the re-action of the system. It was supposed, that there belongs to the animal frame a force or principle, the tendency of which is to resist and obviate the effects of any thing noxious. If such an agent were applied, this principle was believed to be roused into action, and the powers of the system were excited to throw off the noxious application. On this hypothesis, the action of narcotics was explained by Cullen. Their natural tendency was supposed to be to depress the powers of life; if given in a large dose, this was exerted with effect, and hence the symptoms of exhaustion; but if given in a smaller dose, the *vis medicatrix*, or preserving force, was enabled to resist, and by its resistance occasioned the symptoms of increased action that first appeared. These substances, therefore, were considered as directly sedative, and as indirectly stimulant.

The reverse of this view was advanced by Brown, narcotics being regarded as stimulants, surpassing all others in the diffusibility and little du-

rability of their action. On this principle, their effects were explained in the following manner.

It is the necessary effect of stimulant operation, to produce for a time increased action; but as this is attended with a diminution of vital power, the excitement soon ceases, and diminished action succeeds. These effects are proportional, partly to the absolute force of the exciting power, and partly to the rapidity with which it operates. If sufficiently strong, and if it be diffusible and transient in its operation, the excitement it produces is general, is quickly raised to its highest point, and is as quickly followed by proportional languor and diminished action. Or if the dose is large, the stimulant effect is so rapid as to be hardly perceptible, and the sedative or depressing effects only appear. Thus narcotics were regarded as powerful stimulants, the operation of which is not confined to the part to which they are applied, but is rapidly extended over the system. In a moderate dose, they promote action of every kind, which is conspicuous in the function both of the nervous and vascular systems; but this is succeeded by debility proportioned to the excitement that had been raised; and in a large dose, they produce diminution of power, and consequently of action, without any symptom of previous excitement.—Hence they are directly stimulant, and indirectly sedative.

If, in investigating this subject, we merely contrast these two theories, little doubt can remain of the superiority of the latter. The former is founded on the fanciful hypothesis established by no evidence, that a power presides over the system, ready to resist every noxious application; the latter is more strictly deduced from the properties of the substances whose operation is to be explained; for, as it is proved, and indeed admitted, that the stimulant effects from the exhibition of narcotics follow immediately, and previous to any symptoms of languor and debility, these ought to be considered as the consequences of the former. The most extensive analogy, too, may be traced between the operation of narcotics, and other substances allowed to be stimulant, but which are less rapid in their action; as, for example, between ardent spirits and opium, though in the one the stimulant, in the other the sedative operation is usually more apparent. And the advantage derived from the administration of narcotics in some diseases of diminished action, is scarcely compatible with the supposition of their exerting a depressing power.

The principal difficulty attending the theory, arises from the sedative power of these substances not being always proportional to their stimulant operation; it is often greater than this, and in several of them, indeed, any previous stimulant effect is scarcely perceptible. Yet this difficulty is in some measure obviated by the fact, unquestionably established, that substances, the stimulating action of which is undoubted, as ardent spirit, if given in a very large dose, produce depression without any previous perceptible increased action. In like manner, electricity, in moderate intensity, stimulates the muscular fibre to contraction, while in a highly concentrated state, it produces total exhaustion of the contractile power. The more forcibly, therefore, a stimulant operates, the more rapid does the immediate action appear to be produced, and the more quickly to cease, so as to be followed by the secondary effect; and with the admission of this principle, may perhaps be explained the fact, that the sedative effects of narcotics appear often greater than their previous stimulating operation; the exhaustion following so rapidly, that any previous excitement is scarcely to be perceived. Narcotics, therefore, so far as

we can speculate with any probability on their action, may be regarded as general diffusible stimulants.

The hypothesis may also be maintained, perhaps, that along with their stimulating operation, they *directly* exhaust the powers of life; and that these two modes of action are not strictly proportional, but are different in different narcotics. The effects of certain chemical agents on the vital functions, as of nitrous oxide, and carburetted hydrogen, favour an hypothesis of this kind; the one producing high excitement without proportional depression, the other producing exhaustion of power without previous increased action. The truth, however, is, that from our imperfect knowledge of the laws of the living system all such speculations are deficient in precision: nor can we do more than state the most general analogies, without attempting to extend them to minute applications. Thus, in all the theories which have been advanced with regard to the operation of narcotics, the conclusions have been drawn from the action of a few of the most powerful,—alcohol or opium. They are, after all, imperfectly adapted to these, and are still more deficient in relation to the others.

As narcotics are capable of being administered so as to obtain from their action either stimulant or sedative effects, they may be employed as remedies, with the view of producing either of these. The exciting operation, however, is in general so transient, that few of them can be administered with advantage as stimulants. When given with this intention, they are applied in small doses, frequently repeated, as thus the state of excitement is best sustained. More usually they are given with the view of obtaining that state of diminished action and susceptibility to impression, which is the more common, and more easily regulated consequence of their operation; they are then given in larger doses at more distant intervals. As stimulants, they are employed in various forms of continued fever, remittent and intermittent fever, and numerous diseases of debility. As sedatives, they are still more extensively used to alleviate or remove spasmodic action, to allay pain and irritation, to induce sleep, and to restrain morbidly increased evacuations and secretions.

There is a peculiarity in the operation of narcotics, that by repetition their action on the system is diminished, so that, after having been used for some time, they require to be given in increased doses to produce their usual effects, and quantities of them have at last been taken, which at first would have destroyed life. No satisfactory explanation has been given of this, for it is not connected with any apparent permanent change in the system; but it requires to be attended to in their administration. It appears too to be more peculiarly the case with some than with others. It is remarkably so with opium, tobacco, hemlock, or henbane, while it is scarcely to be observed with regard to foxglove.

The individual narcotics may be arranged partly from their chemical relations, party from analogies in power.

NARCOTICS.

Alcohol.	Atropa Belladona.
Ether.	Aconitum Napellus.
Camphor.	Conium Maculatum.
Papaver Somniferum.	Digitalis Purpurea.
Hyoscyamus Niger.	Nicotiana Tabacum.

Lactuca Virosa.	Arnica Montana.
Lactuca Sativa.	Humulus Lupulus.
Datura Stramonium.	Strychnos Nux Vomica.
Rhododendron Chrysanthum.	Prunus Lauro-Cerasus.
Rhus Toxicodendron.	

ALCOHOL. Alcohol. *Ardent Spirit. Spirit of Wine.*

By the process of vinous fermentation, liquors are formed from certain vegetable juices, or infusions, possessed of pungency, spiritous flavour, and intoxicating power. From these liquors a product is obtained by the process of distillation, which, in the diluted state in which it is at first procured, forms what was named Pure Ardent Spirit, or Spirit of Wine, by the older chemists,--names for which that of Alcohol is substituted in modern chemical language. This substance operates on the living system as a highly diffusible stimulant; in the state of spiritous and vinous liquors, it is employed for medicinal purposes; and in its pure form is an important pharmaceutic agent.

Alcohol is formed during the process of fermentation; and from the changes which occur during that process, we endeavour to infer the theory of its formation. Saccharine matter, in the state in which it exists in sweet vegetable juices, and fecula which has been converted by malting into sugar, or even fecula to a certain extent unmalted, are the substances susceptible of fermentation: the access of the air is not necessary to it; and the water of the fermenting liquor does not appear to suffer decomposition. The series of changes, whence the alcohol is formed, must arise therefore, from the re-action of the elements of the vegetable matter, and the new combinations which are established. These elements are carbon, hydrogen, and oxygen; during the fermentation, carbonic acid is formed and disengaged; this must be derived from the combination of portions of the oxygen and carbon of the saccharine matter, (or of the fecula, which is of similar composition); and the alcohol, which is the other product of the process, may, under this point of view, be considered as a compound of the remaining elements; in other words, of the hydrogen of the sugar with its remaining carbon and oxygen. This is the theory of the vinous fermentation, and of the composition of alcohol inferred by Lavoisier, from experiments undertaken with the view of investigating this subject.

More recent researches, however, have shewn that it is imperfect. Lavoisier had supposed that saccharine matter alone is capable of fermenting, and that the whole changes which occur during the process are changes in its composition. But this is not strictly true. To excite fermentation in a solution of sugar, a certain quantity of what is named ferment, of which yeast is a variety, is necessary, and sweet vegetable juices suffer it only from naturally containing this ferment. The agency of this substance remains to be explained, and this has not been done in a satisfactory manner. It appears to approach to gluten or albumen in its nature, and, in particular, contains nitrogen in its composition. This nitrogen, it is shewn by the experiments of Thenard, disappears during the fermentation, and he has supposed that it enters into the composition of the alcohol, while a portion too of the carbon of the ferment combines with a part of the oxygen of the sugar, and contributes to form the carbonic acid disengaged.

From the analysis of alcohol, it appears to be a compound of carbonic, hydrogen, and oxygen; hence, in burning, it affords water and carbonic acid, and the quantity of water produced exceeds even the alcohol in weight. Lavoisier inferred, that it consists of 28.5 of carbon, 7.8 of hydrogen, and 63.5 of water, without any conclusive proof, however, that this large quantity of water exists in it fully formed, and not in part in the state of its elements. Saussure, in decomposing alcohol, by detonating the vapour of it with oxygen gas, or by passing it through an ignited tube, discovered a little nitrogen in its composition, and has given the following as the proportions of its elements: carbon 43.65, oxygen 37.85, hydrogen 14.94, nitrogen 3.52. But with regard to the results of this analysis, it remains uncertain what proportions of oxygen and hydrogen exist in the composition of the alcohol as immediate principles, and what exist in it in the state of water.

The process of obtaining alcohol consists in submitting vinous or fermented liquors to distillation. It distils over with a quantity of water, and in this manner are formed the spiritous liquors of commerce, these deriving peculiar flavour from the substances from which the fermented liquor has been prepared. These spiritous liquors, by repeated distillations, afford alcohol in a more concentrated state, different substances being added to facilitate the concentration and rectification. The details of the process belong to the pharmaceutical part of the work.

It had usually been supposed, that the alcohol obtained by distillation from fermented liquors, pre-exists in them. The opposite opinion, that it is formed during the distillation, was advanced by Fabroni, principally from his finding that no portion of alcohol can be detected in wine previous to distillation by dissolving potash in it to saturation, though by this method a small quantity of alcohol added to the wine is, according to his experiments, easily separated, and floats on the solution. This result always appeared improbable, and Mr. Brande, on repeating Fabroni's experiments, found them incorrect. He afterwards succeeded in obtaining spirit from wine without distillation, by first precipitating the extractive and colouring matter by acetate of lead, and then adding subcarbonate of potash in large quantity, which combines with the water and separates the spirit. It is a singular fact, however, that the intoxicating power of wine is not equal to what might be expected from the portion of spirit it yields by distillation. Brandy, for example, according to Brande's experiment, affords about 53 *per cent.* of alcohol, while Port Wine yields from 21 to 25 *per cent.* Yet the spiritous strength of the latter, estimated by its action on the living system, is certainly not equal to one half that of the former. If the whole of the alcohol, therefore, obtained from wine by distillation, pre-exist in it, its powers must be materially modified by the other principles with which it is combined.

Pure alcohol is colourless and transparent; its odour is fragrant, and its taste highly pungent; it is lighter than water, the difference being greater as the alcohol is more pure and concentrated; hence the specific gravity is the best test of its strength. As prepared by the usual processes, it is of the specific gravity .835, and it is of this strength that it is ordered in the Pharmacopœias, as fit for pharmaceutical purposes. By careful rectification, however, it may be brought to .815, and even to .800; and still, when of this degree of concentration, we have no method of discovering what quantity of water is contained in it; hence we do not know what constitutes real alcohol. When of the common strength, it is so volatile as to evaporate speedily at the common temperature of the atmo-

sphere; it boils at 165° of Fahrenheit. It is highly inflammable, burning when in contact with the air, when its temperature is raised not much above 300°; the products of its combustion are water and carbonic acid.

Alcohol exerts chemical affinities to a number of substances. With water it combines in every proportion. It dissolves a number of saline substances, especially the pure alkalies, and several neutral salts. It likewise dissolves sulphur and phosphorus; and is the solvent of a number of the vegetable principles,—resin, camphor, essential oil, balsam, extract, and saccharine matter.

From this solvent power, alcohol is a very important pharmaceutic agent, particularly as applied to the vegetable articles of the Materia Medica; the principles which it dissolves being those in which medicinal powers frequently reside, and being dissolved by it in such quantity as to afford very active preparations. It has another important property, that of counteracting the spontaneous changes to which vegetables are liable from the re-action of their elements; and hence these solutions or tinctures retain their properties unimpaired. When diluted with an equal quantity of water, it still exerts its solvent power to a certain extent, added to the solvent power of the water; and this diluted alcohol, or Proof Spirit, as it is named, the standard specific gravity of which is .935, that of the London and Dublin Colleges being .930, and made by mixing four parts by measure of alcohol with three parts of water, is even more generally employed in pharmacy as a solvent of vegetable matter, than alcohol in its pure form.

Alcohol is a powerful and highly diffusible stimulant. Taken in a moderate quantity, it immediately increases the force of the circulation, communicates a greater degree of muscular vigour, and excites exhilaration of mind; these gradually subside, and are followed by proportional languor. If the quantity is more considerable, its exciting effects are more quickly produced, and are followed by intoxication, temporary delirium, and stupor: and in a large dose it occasions death, with scarcely any symptoms of previous excitement. Its analogy in producing these effects to other narcotics is sufficiently obvious. Its exciting power, however, appears to be rather more permanent than that of some of the medicines of this class; hence, while it can be successfully employed to rouse the powers of the system, it can scarcely be used with equal advantage to repress irregular action, diminish irritation, or induce sleep.

Alcohol, in its pure state, can scarcely be said to be employed in medicine. Sometimes it is used as an application to burns, and to certain states of local inflammation not connected with increased action; it is applied by friction to relieve muscular pains, or to bleeding wounds to restrain hæmorrhage. Spiritous liquors, which consist of diluted alcohol, are employed as general stimulants to excite the actions of the system. Their stimulant operation, however, is not sufficiently permanent or capable of being regulated, so as to avoid the injurious consequences they are liable to produce, to admit of their being employed, except as occasional remedies.

The action of Wine on the system, though analogous to that of alcohol, is not precisely alike; its stimulant operation appears to be less sudden and more durable; hence it can be employed with more advantage as a tonic. It is as a tonic, indeed, rather than as a narcotic, that wine is administered. Its chief medicinal application is in the treatment of fevers of the typhoid type, to support the strength of the system, and to obviate

symptoms arising from debility. With these views, it is given with more advantage than any other tonic,—a superiority derived from its stimulating power being obtained with more certainty, and being more easily regulated by due administration, from its being more grateful, and probably not requiring to be assimilated by the digestive organs to produce its effects. The quantity in which it is given is dependent on the state of disease; the object to be obtained is that of supporting the strength of the system until the fever has run its course; the danger to be avoided is that of giving it so largely, as to occasion any degree of exhaustion. Its administration is regulated, therefore, by the effects it produces; advantage being always derived from it, when it renders the pulse more slow and firm; when the recurrence of delirium is prevented; when irritation is lessened, and sleep induced. If the pulse is quickened, and the countenance becomes flushed; if it excite thirst, increase the heat of the body, and occasion restlessness or delirium, it is obviously injurious; and the dose must either be diminished, or its use suspended. In general its operation is less powerful than it is on the system in a state of health; larger quantities therefore can be taken, and are even required, to produce any exciting effect.

In various diseases of chronic weakness, or where the strength of the system has been reduced by profuse evacuations, or by any other debilitating operation, wine is in common use as a cordial and tonic.

Different wines have different effects, according as they are possessed of astringency, or as they are sweet or acescent; and are hence adapted to answer different indications.

The wines prepared from other fruits than the grape, as less spiritous and more acescent, and are hence inferior in tonic power. Fermented liquors, especially porter, are sometimes substituted for wine, where this is necessary from idiosyncracy, and their powers are somewhat modified by their other qualities, particularly their bitterness, and by the pungency arising from their excess of carbonic acid. Their narcotic power too is often greater than is proportioned to their vinous strength, from the addition of narcotic substances which they often receive in their preparation.

From the moderate and long continued use of vinous and spiritous liquors, many diseases derive their origin; dyspepsia, hypochondriasis, visceral obstructions, chronic inflammation of the liver, and gout,—morbid states probably arising either from the increased action it excites, giving rise to organic derangement, or from the exhaustion of power, general or local, produced by stimulant operation unnecessarily excited or too long continued. In an excessive dose, spiritous liquors produce a state of coma or apoplexy, which has sometimes a fatal termination. Evacuation of the stomach by a powerful emetic, is the remedy obviously indicated, and from what has been stated under the general account of the operation of narcotics, (page 70), the propriety of sustaining respiration by artificial inflation of the lungs, if necessary, is equally obvious.

Æther Sulphuricus. *Sulphuric Ether.* [illegible]

Alcohol suffers decomposition from the action of the more powerful acids upon it; and substances are formed by these decompositions which have a resemblance in their properties, though, as produced by the action of the different acids, they have also peculiar powers. They are named Ethers. Sulphuric ether, formed by the action of sulphuric acid

on alcohol, is the one that has been chiefly applied to medicinal use; its powers are those of a narcotic. Nitric either, in the state in which it has been used, dilute, and with a portion of free acid, forming the spirit of Nitrous Ether, or Dulcified Spirit of Nitre, acts principally as a diuretic, and is therefore placed under that class. The other ethers are of more difficult preparation, and have scarcely been introduced into the Materia Medica.

Sulphuric ether is obtained by exposing a mixture of sulphuric acid and alcohol in equal weights, to a heat sufficient to produce ebullition: the ether is the product of the action of the acid on the alcohol; it distils over, and is purified by a second distillation, any free acid being abstracted by an alkali. The process is considered more fully in the pharmaceutical part of the work. A diluted preparation is ordered in the pharmacopœias, in which the rectified ether is mixed with two parts of alcohol; and in the London Pharmacopœia there is another preparation, in which a product obtained at the end of the distillation, of an oily appearance, etherial oil as it is named, is added to this diluted ether: neither of these is of any importance.

Sulphuric ether is colourless and transparent, highly odorous and pungent, and of a specific gravity inferior to that of alcohol, being, when highly rectified, not more than .730, compared with the standard specific gravity of water. It is very volatile, so as to evaporate speedily at natural temperatures; and from its rapid transition to vapour, it produces much cold during its evaporation. In vacuo it boils below the freezing point of water, and under the atmospheric pressure it boils at 98°. It is highly inflammable, and affords by its combustion water and carbonic acid. It differs from alcohol, principally in containing a larger proportion of hydrogen, and to this its greater levity and volatility are probably owing. The proportions of its elements, assigned by Saussure, are carbon 67.98, oxygen 17.62, hydrogen 14 40.

Sulphuric ether is a powerful diffusible stimulant, somewhat analogous to alcohol in its action, and, like it, capable of producing intoxication. Its stimulant operation appears to be even more suddenly exerted, and to be less durable: hence its superiority as a narcotic and antispasmodic. As a stimulant, it is sometimes given in occasional doses in typhus fever, more particularly in those cases where symptoms are present, connected with spasmodic action; it is also given in other forms of fever to obviate nausea; and it is said to be useful in abating the violence of sea-sickness. As an antispasmodic, it is employed in spasmodic asthma, and sometimes affords sudden and complete relief, producing for a time at least remission of the paroxysm; it is also given with advantage in the hysteric paroxysm: it is one of the most powerful remedies in cramp of the stomach, and singultus; and it sometimes relieves some of the symptoms of cholera, especially the vomiting. Its usual dose is a tea-spoonful, equal to about a drachm; but its beneficial effects are frequently not obtained, unless it be given in a larger dose, or until the dose has been repeated at short intervals. In dyspnœa and catarrh, its vapour inhaled into the lungs affords relief, probably from its antispasmodic power. The mode of applying it in this form, is to allow it to drop slowly on hot water in an inhaler, and inspire the vapour of it with the steam of the water. Externally applied, it relieves muscular pains; it is an excellent application to burns; and from the degree of cold which attends its evaporation, it has been em-

ployed to favour the reduction of strangulated hernia, being dropt on the tumour, and allowed to evaporate freely.

Camphora. Camphor. Laurus Camphora, Lin. *Cl. Enneandria. Ord. Monogynia. Nat. Ord. Oleraceæ. Habitat, Japan, India.*

Camphor is not the produce exclusively of one vegetable, but it is contained in many plants, especially those of the aromatic kind, diffused through their wood or bark, and is often deposited from their essential oils when these are long kept. The oils of peppermint, thyme, sage, and a number of others, thus afford it. For the purposes of commerce, it is obtained from a species of laurel, the Laurus Camphora, a native of Japan and Sumatra. It exists in grains in the wood of the root and branches of this tree. It is extracted by sublimation ; the wood is exposed to heat with a quantity of water, and the temperature thus communicated is sufficient to volatilize the camphor; in Europe, it is purified by a second sublimation, with the addition of one twentieth of its weight of lime.

Camphor is colourless, semi-transparent, tenacious, and somewhat unctuous to the touch ; its smell is strong and fragrant ; its taste pungent and bitter; specific gravity .9887. It is volatile at natural temperatures, and soon diminishes in bulk from exposure to the air ; it melts at a heat a little superior to 212° ; boils at 400° ; is highly inflammable ; it is very sparingly soluble in water, as one fluidounce dissolves little more than half a grain; but is entirely soluble in alcohol, ether, and oils essential or expressed. The alkalies do not act upon it. The weaker acids, particularly the acetic, dissolve it ; the more powerful acids decompose it. These properties are sufficient to distinguish it from the other vegetable principles. It approaches nearest in its characters to essential oil, and appears to differ from oil in chemical composition, principally in containing a larger proportion of carbon. Hence, when its volatilization is prevented, and it is subjected to a temperature so high as to decompose it, as may be done by exposing it in mixture with pure clay to a heat suddenly raised, it affords a liquid, having all the properties of an essential oil, odorous and pungent. There remains a considerable proportion of charcoal; carbonic acid, and carburetted hydrogen gases are disengaged, and an acid liquid is obtained, named camphoric acid. This acid, which is also formed from camphor by combustion, and by the action of nitrous acid, has some resemblance to benzoic acid.

In a moderate dose, camphor produces effects similar to those of other narcotics. Its stimulant operation, however, is not considerable ; and in a large dose it diminishes the force of the circulation, induces sleep, and sometimes causes delirium, vertigo, convulsions, or coma.

As a stimulant, camphor has been used in typhus, cynanche maligna, confluent small-pox, and other febrile affections accompanied with debility, in retrocedent gout, and to check the progress of gangrene; but its stimulant operation is scarcely sufficiently permanent to admit of being easily regulated. As a sedative, it is used in affections of an opposite nature, pneumonia, rhumatism, and gonorrhœa, combined with nitre or antimonials, or by itself, where evacuations have been previously employed; in these cases also it is now little employed in practice. In mania, it has sometimes succeeded as an anodyne ; as an antispasmodic, it has been used in asthma, chorea, and epilepsy. If given in excess, the best antidote is opium.

The dose of camphor is from 5 to 20 grains, but it is seldom that it is given at once in so large a dose as the latter quantity, from being liable to produce nausea and irritation. In small doses, on the other hand, it produces little effect; unless they are frequently repeated. In divided doses, it may be given to the extent of a drachm in the day. Its power of checking the progress of gangrene has been supposed to be augmented by combination with musk, or carbonate of ammonia, but the efficacy of this combination is doubtful: combined with opium, it forms a diaphoretic; and its efficacy in inflammatory diseases is promoted by antimonials.

Camphor ought to be given in a state of mixture of some liquid form, as in the solid state it is liable to excite nausea. It may be diffused in water by trituration with sugar, mucilage, or almonds. The camphorated mixture of the London Pharmacopœia, in which it is triturated with water, is a preparation in which, from the sparing solubility of camphor in water, little more than its taste and odour are obtained. In the pharmaceutic treatment of camphor, it is necessary, in order to reduce it to powder, to add a few drops of alcohol during the trituration. Magnesia, by being triturated with it, has the effect of dividing and rendering it smooth, and may be used for its suspension in water: a number of the gum-resins also act on it in such a manner, that, from their mixture, a soft uniform mass is formed, and this affords another mode of diffusing it. From this chemical action, it cannot well be combined with gum-resins in the solid form.

Externally applied, camphor is used as an anodyne in rheumatism and muscular pains, and as a discutient in bruises and in inflammatory affections; it is dissolved in alcohol or expressed oil, and applied by friction to the part. Added to collyria, or mixed with lard, it is of advantage in ophthalmia. Suspended in oil, it is used as an injection in ardor urinæ, and as an enema to relieve the uneasy sensations occasioned by ascarides. The combination of it with opium is useful as a local application in tooth-ach.*

Officinal Preparations.—Tinct. Camph. Tinct. Camph. Composit. Emulsio Camphorata Acid. Acetos. Camphorat. Tinct. Saponis Camphorat. Liniment. Saponis cum Opio. Oleum Camph. *Ed.* Mist. Camph. *Lond. Dub.* Liniment. Camphoræ Composit. *Lond.*

Papaver Somniferum. White Poppy. *Polyand. Monogyn. Rhœades. Capsula et Succus Spissatus. Europe, Asia.*

The White Poppy is a native of the warmer regions of Europe and Asia; it also grows in colder climates without any diminution of its powers. The large capsule which it bears, affords, by incision in its cortical part, a milky juice, which, by exposure to the sun and air, becomes concrete, and of a brown colour. This is named Opium, and is the product of the plant that is chiefly medicinally employed. The leaves and stalks afford by expression a juice which is narcotic, but of inferior strength; the seeds contained in the capsule are bland and inert. Opium has been obtained in this country of full narcotic power from the Poppy, but at an expense which does not admit of the cultivation of the plant. It is usually imported from Syria and India. It is obtained by a simple method. When the capsule has nearly attained maturity, a longitudinal incision is made in its side, care being taken that it does not penetrate into the cavity. This

* *Incompatible Substances.* Camphor is not affected by any substance with which we can combine it. Paris Pharm. *Ed.*

is done in the evening; the milky narcotic juice exudes, apparently from the vessels of the bark of the capsule; it adheres to the sides of the incision; is collected in the morning, and a large quantity being procured from a field of poppies, it is inspissated by exposure to the sun.

The opium of commerce is in flat or rounded masses, which, when cut, present a substance soft and tenacious, of a dark reddish-brown colour, having a strong odour somewhat fœtid, and a taste bitter and acrid. If kept in a dry place it becomes hard, but it retains its brown colour, and its fracture presents a resinous appearance. It also softens when pressed in the hand. These are the properties of what are named Turkey Opium, the kind met with in the shops. If hard, brittle, and of a grey colour, with black spots and no lustre, it is of inferior quality. What is sold by the name of East India Opium, is soft, of a blackish colour, has a fainter smell, and is much inferior in narcotic power.

Though opium has been often submitted to analysis, its proximate principles are imperfectly determined. It is highly inflammable; submitted to the action of alcohol, a considerable portion of it is dissolved; and water likewise dissolves it in part. The solution in alcohol is more highly impregnated with dissolved matter than that in water: and it possesses, in a much greater degree, the narcotic power. Diluted alcohol, composed of equal parts of alcohol and water, appears to dissolve all the active matter of opium; the tincture prepared by this menstruum, when the due proportion of solvent is employed, being equal, or very nearly so, in power, to the quantity of opium submitted to its action. After the joint action of alcohol and water, there remains, mixed with the impurities, a substance plastic and glutinous, the nature of which has not been ascertained; Bucholz considering it as similar to caoutchouc, and Gren supposing it analogous to gluten; it retains no activity; its proportion is about one part from twelve of Turkey opium; it is not present in India opium. By boiling in water under exposure to the air, the narcotic power of opium is impaired; this can scarcely be ascribed to the dissipation of any active volatile principle; for when water is distilled from it, and condensed, it is found to have scarcely any narcotic quality; it must therefore be owing to changes produced at this temperature in the principles in which the activity of the opium resides. The distilled water from opium is slightly milky, and has its odour, and in part its taste; a film collects on its surface, but no sensible portion of oil is obtained.

From these facts it is not easy to draw any precise conclusion with regard to the nature of the active matter of opium. As it is partly soluble both in water and in alcohol, and appears to suffer decomposition when boiled in water under exposure to the air, it might be concluded to be of the nature of extractive matter. On the contrary, being inflammable, and more soluble in alcohol than in water, it approaches in its characters to resin; yet it is not purely resinous, for its solution in alcohol is but slightly decomposed by water. The quantity of this principle more peculiarly soluble in alcohol, and in which the powers of opium chiefly reside, appears to amount to about five parts in twelve. The quantity of matter soluble in water is, according to Crumpe, in nearly the same proportion. It is not precipitated by alcohol, and its nature is not well known. The slight narcotic power it has, is probably derived from a portion of the other matter adhering to it. The analysis of opium, in common with many of the other articles of the Materia Medica, affords sufficient proof

of our very imperfect knowledge of the constituent proximate principles of vegetable matter.

It has been stated by Dérosne, that a peculiar principle exists in opium, in which its narcotic quality resides. It is obtained by digesting water on opium, and evaporating the solution; a matter which precipitates during the evaporation, and which consists of this principle with a portion of resin and extract, is to be digested with alcohol; the resin and this principle are dissolved; and as the solution cools, the latter separates in crystalline grains, which may be purified by solution and crystallization; it is described as being in prisms, white, insipid, and inodorous; insoluble in cold water, very sparingly soluble in hot water, but dissolved by alcohol, ether, and by the acids and alkalies. The nature of this substance is not well determined, but it cannot be regarded as the narcotic principle of opium, since its power, though it exists in small proportion only to the other principles, does not appear to have much exceeded that of opium itself. Mr. Thompson states, in his London Dispensatory, that in repeating Dérosne's experiments, he had obtained a larger proportion of crystals of this salt from the East Indian, than from the Turkey opium.

The recent observations of Serturner, Vauquelin, and Robiquet, have more clearly shown the nature of the principle on which the narcotic effects of opium depend, it differs essentially from that stated by Dérosne, as it possesses all the chemical characters of an alkali, existing in the opium in combination with a peculiar acid called the *meconic*. The substance discovered by Dérosne, Serturner states to be the salt formed by the combination of this alkaline body with the meconic acid. The following is the process by which Serturner procured it. Eight ounces of dry opium were digested by heat in successive portions of distilled water, until it became entirely colourless: an extract is obtained by the evaporation of the liquid, turbid, if diffused in water, but rendered transparent, either by heat or an additional quantity of water. Upon adding an excess of ammonia, a greyish-white coloured substance is precipitated in the form of irregular transparent crystals. These crystals are the morphine, combined with a little extractive matter, and the meconic acid. Serturner next saturated the crystals by a slight excess of sulphuric acid, and exposed them repeatedly to the action of ammonia so as to separate the most of the extractive matter. To free it, however, entirely from this, it required afterwards to be repeatedly washed with alcohol, when it became nearly colourless; and after being dissolved frequently in that substance, it was obtained in pure crystalline prisms.

Morphin, when pure, is perfectly colourless, is sparingly soluble in boiling water, but abundantly so in alcohol or ether, dissolved in either of which it forms a very bitter solution; it possesses the usual properties of an alkali, restoring the colour of litmus when reddened by an acid, forming neutral salts with the acids, and decomposing the compounds of acids with the metallic oxides; it does not, however, form soaps with oils; it melts easily, and is scarcely affected by galvanic electricity. Its composition is stated to be as follows: hydrogen 0.0555, carbon 0.4528, oxygen 0.4917 = 1.0000.

Morphin exists in opium combined with an acid, to which Serturner has given the name of the *Meconic*: this meconic acid may be obtained by boiling the infusion of opium with magnesia, and digesting the precipitate in alcohol. The meconiate of magnesia thus obtained, is next to be dissolv-

ed in diluted sulphuric acid, and upon adding the muriate of barytes, a precipitate is formed, composed of the sulphate and meconiate of barytes; and by digesting this precipitate in diluted sulphuric acid, it is decomposed, and by evaporation the meconic acid is obtained in crystals, rendered more pure by sublimation.

These crystals are fusible at 256°, and are sublimed without decomposition. They are very soluble both in water and alcohol, and redden litmus. As an acid, it does not possess any very deleterious property, but the morphin, or morphia, according to some, is extremely violent in its action, though taken in very small doses; but Orfila states, that he gave ten grains to a dog without any sensible effect.

The facts ascertained with regard to the action of the usual re-agents upon opium, are of importance, as pointing out its proper pharmaceutic treatment. Diluted alcohol dissolving all its active matter, is the menstruum best adapted to its preparation under the form of tincture. Water can scarcely be employed with advantage. Vinegar dissolves its active matter, but has been found to impair its narcotic power, probably by causing in it some chemical change. Wine, though it dissolves its active principles, being liable to pass to the state of vinegar, is also a less proper menstruum. Any purification of opium, by dissolving it and evaporating the solution, only weakens its strength, and renders it uncertain; and hence this process is now discarded from the Pharmacopœias, or at least is retained only in that of the Dublin College.

The effects of opium on the system are those of a powerful narcotic. When given in a moderate dose, as that of one grain, to a person unaccustomed to its use, the pulse is soon sensibly increased in frequency. fulness, and force; if the dose is rather larger, this is accompanied with some degree of exhilaration, the different functions both of body and mind are performed with more vigour, and this state may rise even to intoxication and delirium. These effects, however, are transient; the pulse returns to its former standard, and it continues to fall both in frequency and force, but usually remains soft and full; a degree of lassitude and drowsiness is produced, sensibility to external impressions is impaired, so that pain, if present, is less severely felt, and after some time this diminished sensibility terminates in sleep: or if this does not happen, a state of languor and calmness comes on, and continues usually for some hours; the skin is warm and moist, the secretions are diminished, and there is generally some thirst. This stage of the operation is usually succeeded in those unaccustomed to its use, by some degree of nausea or headach, and sometimes by tremors of the voluntary muscles; the peristaltic motion of the intestines is diminished, so that costiveness follows: the appetite and digestion are also impaired. The exciting operation of opium may continue nearly an hour, the sedative effect usually six or eight hours.

From a larger dose all these effects are produced in a more marked degree. In those particularly who are accustomed to its use, the exhilarating operation from such a dose is equal to, or exceeds that from wine, as is proved by the striking effects it produces on those who indulge in it habitually to excess among Mahommedan nations, where the established religion prohibits the use of wine; in those not accustomed to it, it is less evident, probably from the system not habituated to it, being unable to bear the necessary dose; in both, however, the state of diminished sensibility and action quickly succeeds, the dulness and languor are greater,

and sleep, sometimes approaching to stupor, is induced; when this terminates, thirst, headach, and nausea are urgent, vomiting frequently occurs, with tremors and general debility. If the quantity is still larger, the consequences are delirium, stupor, flushing of the countenance, slow and stertorous breathing, an oppressed pulse, convulsions, and death.

From the topical application of opium to sensible and irritable parts, pain, increased muscular action, augmented heat, and even inflammation, are the first effects, but are ultimately succeeded by a greater insensibility to impressions, and a greater difficulty of being excited to contraction by the application of other stimulants. The latter state is also immediately produced by its application in a large quantity and concentrated state to the muscular fibre.

With regard to the nature of the action of opium on the living system, opinions have been maintained diametrically opposite. It was usually considered as a sedative, or substance, the operation of which is to depress the functions, and exhaust the powers of life. The theory was advanced by Brown, that its primary operation is stimulant, and that its apparent sedative effects are the consequences of the exhaustion of vital power, from the excess of stimulant action. The primary effects from its exhibition, so far as they can be accurately ascertained, undoubtedly lead, by the least hypothetical induction, to the latter opinion. They are those of excitement, both of the vascular and nervous systems; and the state of diminished susceptibility and action which follows, ought in strict reasoning to be considered as the effect of this, conformable to the general law of the animal economy, that excitement suddenly raised is followed by exhaustion of power. In its effects in a large dose, the analogy of opium to other diffusible stimulants is also direct. And its action on the system in a diseased state, appears to prove not less clearly its stimulant operation. In typhus and other diseases of debility, its exhibition in a moderate dose produces the salutary effects resulting from the administration of wine and other powerful stimulants, while in diseases of an opposite nature, where there is increased action, it is not less prejudicial.

It is to be admitted, however, with regard to opium, that its apparent sedative effects, displayed in its lessening the sensibility to external impressions, diminishing action, and inducing sleep, are greater than are proportional to the excitement it raises, or to an equal or a greater excitement produced by other stimulants, as by alcohol. This has been accounted for from the great diffusibility, and less durability of its primary operation; in consequence of which, the excitement it produces is soon extended over the system, and is more quickly succeeded by the secondary state of diminished power. Whether this theory of its action be satisfactory or not, and whether it be regarded as a powerful stimulant, or as a direct sedative, it is to be observed, and the observation extends to analogous narcotics, that the practical application of it is nearly the same; since it is admitted that it may be exhibited so as to obtain from it stimulant and also depressing effects, and that the former are primary, and are obtained from it in a moderate dose, while the latter are secondary, and are only produced by a larger dose. Although, therefore, the explanation of the mode of operation be different, there is no dispute as to the operation itself, or the effects it produces.

Opium was at one time supposed to act on the system, by the medium of the blood; but experiments have shewn, that its general effects are produced when the circulation is interrupted, that its action is on the

living solids, and is propagated to distant parts by nervous communication.

The principal indications which opium is capable of fulfilling, are, supporting the actions of the system, allaying pain and irritation, relieving spasmodic action, inducing sleep, and checking morbidly increased evacuations. It is differently administered, as it is designed to fulfil one or other of these indications. When given with the view of obtaining its stimulant operation, it ought to be administered in small doses, frequently repeated, and slowly increased, as by this mode the excitement it produces is best kept up. But where the design is to mitigate pain or irritation, or the symptoms arising from these, it ought to be given in a full dose, and at distant intervals, by which the state of diminished power and sensibility is most completely induced. It is principally with the latter views that it is employed in medicine; and in its usual medium dose, that of one grain to an adult, any stimulating effect from it is scarcely apparent, while its power of diminishing action, lessening sensibility, and inducing sleep, is sufficiently exerted. Nor can it, in any case, be given with much advantage as a stimulant. Its stimulant operation is even frequently prejudicial; and hence the general rule established with respect to the administration of opium, that it ought not to be given in any pure inflammatory affection, at least unless evacuations have been used, or unless means are employed to determine it to the surface of the body, and produce diaphoresis.

In continued fever, not inflammatory, opium has been administered sometimes as a general stimulant: but its operation being less permanent than that of wine, and not so easily regulated, it is not so well adapted to obviate debility; or at least with this intention it is employed only as subsidiary to wine. It is more frequently used to diminish irritation, and lessen that state of increased susceptibility to impressions connected with debility, which frequently gives rise to restlessness, watchfulness, delirium, and spasmodic affections, particularly tremors and subsultus tendinum. A full dose is usually given at bed-time; and to obviate these symptoms when they are urgent, it is farther occasionally administered, generally in combination with wine, in the course of the day. Its exhibition is improper, or requires to be conducted with much caution, where there is any tendency to inflammatory action, or to determination to the head. It then fails in lessening irritation or procuring sleep, and rather aggravates the inflammatory state, or gives rise to local inflammation. If it increase delirium, it is obviously injurious. An important practical rule is given by Dr. Currie,—that it is rather injurious than otherwise, when the heat of the surface is above the natural standard, and the skin is at the same time dry: but if the skin is becoming moist, it accelerates the change, and produces its other beneficial effects. Hence it is often used with advantage after this change on the surface has been obtained by the cold effusion, or by partial fomentation: it is also for the same reason often useful to delay its administration in the evening, until the febrile exacerbation at that period begins to subside, and to give it therefore at a later hour. When it is repeatedly administered, it is necessary to guard against the constipation it is liable to produce.

In intermittent fever, the administration of an opiate, previous to the expected approach of the paroxysm, renders it milder, or sometimes prevents its attack; given even during the hot stage, it lessens its violence;

and administered in either mode, it facilitates the cure by other remedies, the stimulant operation of which is less transient.

In the phlegmasiæ, the propriety of the employment of opium is from its stimulant operation more doubtful; and in any pure inflammatory affection, attended with highly increased vascular action, it is hazardous. Where it is given so as to determine its action to the surface of the body, and produce sweat, it is often advantageously employed, particularly in rheumatism; or in some of the other diseases of this order, where the inflammatory stage has subsided, its exhibition is occasionally necessary to obviate symptoms connected with irritation.

In the exanthemata, opium is employed with similar intentions, and is often more peculiarly advantageous, by lessening the irritation connected with the eruption. In small-pox, it is useful with this intention after the eruption is completed where it is copious; and if the concomitant fever be of the typhoid type, the same advantage is derived from it as in pure typhus; it is also useful in promoting the maturation of the pustules, and relieving the irritation on the surface. In measles, the state of the system being more purely inflammatory, its use is rather contra-indicated.

In hæmorrhages, not connected with a state of plethora, or of high vascular action, opium is a valuable remedy, by removing that state of increased irritability whence the discharge frequently arises; it is thus employed more particularly in passive menorrhagia, and in the hæmorrhage which sometimes succeeds abortion or delivery.

In the profluviæ, opium is employed with a similar intention. In dysentry, the propriety of its administration has been questioned, but evident advantage is derived from it when it is given in such doses as to relieve the pain and irritation which prevail; the constipation it might produce being obviated by the exhibition of mild purgatives usually employed in the treatment of the disease. The combination of it with calomel is more peculiarly useful.

In catarrh it proves of the highest utility, by obviating the irritation whence the cough arises; it requires, however, to be administered with some caution, where the disease is in its acute stage, and accompanied with an inflammatory state: it can then be given with more safety and advantage when combined with an antimonial, by which its direct stimulant action on the vascular system is obviated, and its operation is determined to the surface of the body. In phthisis it is given as a palliative and anodyne.

In spasmodic and convulsive diseases, opium is obviously indicated, and in many of them is the remedy of greatest power. In chorea, it has been advantageously employed; though the dependence of this disease on the accumulation of feculent matter in the intestines, as established by Dr. Hamilton's observations, suggests the necessity of its being employed with caution, and of its constipating effect being carefully guarded against. In epilepsy, it sometimes abates the violence of the paroxysm, especially where this is liable to recur during sleep: but as this disease so often depends on change of organic structure, the effects of opium can be those only of a palliative; where plethora is present it may be hurtful. In tetanus, to produce any relief, it requires to be given in very large doses, and these must be frequently repeated; and even then the system is often little affected by it; when pushed, however, to a great extent, the violence of the spasmodic affection has at length been overcome, and a cure obtained. A similar remark applies to hydrophobia, in which very

large quantities of opium have been given without any sensible effect on the state of the functions, but in some cases with ultimate success, especially when combined with calomel. In mania, the system is in general little susceptible to the action of any medicine; but opium, when given in sufficient doses, is frequently useful in diminishing irritation, and producing composure or sleep. In other cases it altogether fails, when given even in a very large dose, and sometimes it aggravates the restlessness and agitation of the patient; and when a plethoric or inflammatory state exists, its use must be hazardous. In the hysteric paroxysm, opium is often employed with advantage, either introduced into the stomach, or given under the form of enema. Its frequent employment to relieve the less urgent symptoms of hysteria is improper, as leading to the injurious consequences from its habitual use; and the same remark applies to its employment in hypochondriasis and melancholia. In purely spasmodic asthma, the paroxysm is shortened, and even sometimes cut short by a full dose of an opiate; and in all the varieties of dyspnœa, opium affords more or less relief. In cholic, it relieves the violence of the pain, though its administration requires caution, where there is any tendency to an inflammatory state; and the constipation it is liable to produce requires also to be obviated. In cholera it is the principal remedy, and is given in moderately large and repeated doses, until the symptoms are subdued. In diarrhœa it speedily checks the evacuations, and the precaution is hence necessary, not to use it too freely, until any acrid matter, or substance exciting irritation, has been discharged. In pyrosis, a moderate dose generally affords at least temporary relief; and it also frequently succeeds in checking vomiting from morbid irritability of the stomach.

Opium is given to relieve the pain of gastrodynia, and that attending icterus; and in that form of jaundice depending on calculus of the biliary ducts, by lessening irritation and relieving spasm, it promotes the discharge. It is given on the same principle to relieve the pain and promote the discharge of urinary calculus. In syphilis, it is employed principally with the intention of alleviating the irritation arising from the operation of mercury; for there is no sufficient evidence for the opinion which has been advanced that it is possessed of anti-syphilitic power. Considerable advantage is derived from its use in extensive venereal ulceration; as well as in the treatment of painful and irritable ulcers, not connected with a venereal taint. It is given as a stimulant to check the progress of gangrene, and frequently with marked advantage, as well as to relieve those spasmodic symptoms, and that state of irritation which accompany gangrene, or the injuries from which it arises.

In many other cases of morbid affection, opium is had recourse to merely to lessen irritation, relieve pain, or induce sleep. As a palliative and anodyne, it is indeed the most valuable article of the Materia Medica, and its place could scarcely be supplied by any other.

Externally applied, opium alleviates pain and spasmodic action. Applied by friction, it was known to relieve the pain of cramp, and even of tetanus; and rubbed over the abdomen, to alleviate spasmodic pain of the stomach and intestines. From recent observations by some of the continental physicians, which have been confirmed in this country, it appears that this mode of employing it admits of more extensive application, and even in general affections of the system. It has succeeded in reducing the violence of the paroxysm of mania, and in relieving the delirium of typhoid fever, removing irritation and inducing sleep; and

much advantage has been derived from this application of it in some forms of dysuria, in cholera, and hysteria. In trismus, either hysterical or arising from other causes, relaxation of the spasm has been obtained from opiate friction. Dr. Percival employed for this purpose a liniment, in which opium is triturated with half its weight of camphor to render it smooth, and this is mixed with a little lard ; a quantity requires to be rubbed in, containing from 6 to 9 grains of opium to obtain its action on the general system. According to Mr. Ward's observations, the tincture of opium is preferable as producing more speedy and certain effects ; from 3 to 6 drachms of it being employed, according to the severity of the symptoms, and being rubbed on the sides of the arms, until the whole is absorbed. This mode of application has the advantage of avoiding the action of opium on the stomach and intestinal canal.

By local application, opium relieves the pain of toothach, a little of it being introduced into the cavity of the affected tooth, or the gums being rubbed with laudanum ; sometimes even it succeeds when applied to the temple or cheek. Under the form of enema, it is of singular efficacy in relieving tenesmus, and that painful affection of the prostate gland, which is sometimes the consequence of the discharge in gonorrhœa having been suddenly checked ; and also that irritable state of the neck of the bladder, which renders the discharge of urine painful. It is used under the same form in diseases where it cannot be introduced into the stomach. A very dilute watery solution of it, injected into the urethra, has been used to relieve *ardor urinæ* in gonorrhœa ; and a few drops of the vinous infusion, introduced beneath the eye-lids, is of much efficacy in some forms of ophthalmia, where the active inflammation has ceased.

The dose of this narcotic is very various, according to the state of disease, and the intention with which it is administered. One grain is the medium quantity to a person unaccustomed to its use ; but to remove the symptoms from irritation, or relieve pain, it often requires to be given in a larger quantity. Its stimulating operation is principally obtained by frequent repetition of small doses : its sedative effect by a larger dose, repeated, if necessary, at greater intervals. Its power on the system soon becomes weaker, and from habitual use is so much impaired, that very large doses are required to produce its usual effects. In some diseases, too, particularly mania, tetanus, and hydrophobia, it produces little sensible effect unless the dose be very large. In the last disease, it has been taken to the extent of two drachms in twelve hours, without abating the violence of the symptoms. Lastly, the operation of opium is much varied by idiosyncracy, the same dose producing very different effects on different individuals. Too small a dose of opium is liable to produce restlessness or disturbed sleep. The latter effect, with sickness and thirst, and sometimes delirium, are the consequences of a dose rather too large.

By the immoderate or long continued use of opium, the vigour of the digestive organs is impaired : hence loss of appetite, wasting of the body, and muscular weakness ; the nervous system, and even the functions of the mind, are affected ; the patient is distressed with uneasy sensations, which are imperfectly relieved by other stimulants, if opium is withheld, and at length fatuity and stupor are induced.

When such a dose of opium is taken, as would prove fatal if its effects were not obviated, the symptoms which usually occur are, insensibility, so that the patient cannot be roused by any exertion,—a pulse slow and full,—deep and difficult breathing, with the countenance generally flush-

ed: this state of stupor continues, sometimes with occasional convulsions, until it terminate in death. The principal remedy in such a case is the immediate exhibition of an emetic, which requires to be of the most powerful kind. Sulphate of zinc, or sulphate of copper is generally used, dissolved in water, and introduced by a flexible tube into the stomach, the former in the dose of one scruple, the latter in a dose of from five to ten, or even fifteen grains. The sulphate of copper is by far the most powerful, and if the other has failed, ought to be immediately given. In using either of them, if vomiting is not soon induced, the dose ought to be repeated. Along with this is employed free dilution with the vegetable acids, as vinegar, which is to be swallowed in as large draughts as the stomach can receive it. According to Orfila, when opium is given to animals along with vinegar, they die sooner than when it is merely diffused in water; the solution of opium in vinegar being even more deleterious. But if opium, after producing its deleterious effects, has been rejected from the stomach, or if it has given rise to these effects from having been introduced into a wound, vinegar or other acids introduced into the stomach counteract them, and in several instances appear to have saved the patient's life. The powers of the stomach and of the general system may be roused and sustained by small doses of warm brandy, spirit of ammonia, and other stimulants; coffee has been said to have been taken with advantage: and the patient ought to be kept awake, and, if possible, in a state of gentle motion, at least for some hours. Analogy, from the operation of other narcotics, points out the necessity of exciting artificial respiration, if necessary, in the state of extreme stupor, as has been already explained, (page 70.)

Opium is used either solid, or under the form of tincture, twenty-five drops of the tincture being equal to one grain of crude opium. It is employed in the solid state when we wish it to act slowly, or on the stomach or intestinal canal, otherwise it is more convenient in the liquid form. There are, besides, various preparations, in which it is either the principal ingredient, or modifies the power of others, few of which, however, are of much importance. The officinal opiate electuary, powder, and pill, merely afford convenient forms for its exhibition. The powder of opium and ipecacuan is the composition under which it is usually employed as a sudorific. The Ammoniated and Camphorated Tinctures of Opium, are the Paregoric Elixirs of the older pharmacopœias, forms under which opium has been principally used in catarrh. The troches of liquorice and opium are likewise designed to allay the cough in catarrh, by being allowed to dissolve slowly in the mouth. The Tincture of Opium and Soap, and the Plaster of Opium, are intended for external application. The Opium wine, besides its internal administration, is employed as a topical application to the eye in chronic ophthalmia. The Syrup is designed for administration to children.

A preparation is in use under the name of the Black Drop, considered by some practitioners to possess peculiar advantages. It is a more concentrated preparation than the common tincture of opium, and requires to be given in not more than half the quantity. The following is the formula given for its preparation:—Take half a pound of opium sliced, three pints of good verjuice, one and a half once of nutmegs, and half an ounce of saffron: Boil to a proper thickness, then add a quarter of a pound of sugar, and two spoonfuls of yeast. Set the whole in a warm place near the fire for six or eight weeks, then place it in the open air

until it becomes a syrup, and lastly, decant, filter, and bottle it up, adding a little sugar to each bottle. This preparation has been recommended chiefly from its not affecting the stomach and head so much as the other preparations of opium.*

Officinal Preparations.—Elect. Opiat. Pil. Opiat. Pulv. Opiat. Pulv. Ipecac. et Opii. Tinct. Opii. Tinct. Opii. Ammoniata. Tinct. Opii. Camphorata. Tinct. Saponis et Opii. Troch. Glycirrhiz. cum opio. *Ed.* Opium Purificatum. Pil. Saponis cum opio. Pulv. Cornu Usti cum opio. Pulv. Cret. comp. cum opio. Vin. Opii. Extr. Opii. Emplast. Opii. *Lond.*—Extr. Opii. Syrup. Opii. *Dub.*

The dried capsule of the poppy is sometimes employed for medicinal purposes. Its active matter is extracted by decoction with water; this evaporated, affords an extract similar to opium, but weaker, or it is made into a syrup, by boiling with sugar, which is used as an anodyne. This syrup is a weak preparation, and is in general only given to children. One ounce of it is supposed to be equal to one grain of opium, but it is liable to be variable in strength. The dose to a child a year old is one drachm. A syrup made from opium has been supposed to be preferable, as the dose can be regulated with more certainty, and a formula of this kind is accordingly adopted by the Dublin College; the watery extract of opium being dissolved in water, and formed into a syrup, by the due proportion of sugar. But it is somewhat doubtful if the dissolved matter remains permanently diffused in this syrup. An infusion of the capsule is used as an anodyne fomentation.

Offic. Prep.—Extr. Papav. somnif. Syr. Papav. somnif. *Ed.*—Decoct. Papav. *Lond.*

Hyoscyamus Niger. Black Henbane. *Pentand. Monog. Solanaceæ. Herba, Semen. Indigenous.*

The leaves of this plant, when recent, have a slightly fœtid smell, and a mucilaginous taste; when dried, they lose both taste and smell, and their narcotic strength is in part impaired. The root possesses the same qualities as the leaves, and even in a more eminent degree, but it is liable to be more variable in strength. The seeds also are narcotic. The leaves only are medicinally employed; they afford a juice which possesses their narcotic power, and which inspissated forms an officinal preparation; they also yield their active matter to diluted alcohol; its active principle, (Hyoscyama,) is said to be of an alkaline nature.

Henbane has a greater analogy to opium in its action than any other narcotic has, particularly in the power of inducing sleep. In a moderate dose, it increases at first the strength of the pulse, and occasions some sense of heat, which are followed by diminished sensibility and motion; in some cases by thirst, sickness, stupor, and almost always by some affection of vision. In a larger quantity, it occasions profound sleep, hard pulse, and sometimes delirium; and in a dose which proves fatal, its ope-

* *Incompatible Substances.* Oxy-muriate of mercury; acetate of lead; alkalies; infusions of galls, and of yellow cinchona. Orfila states that the decoction of coffee is less energetic as an antidote, than the infusion. When we intend the opium to act as a sedative, we should not combine it with stimulants. Paris. *Ed.*

ration soon terminates in coma, with a remarkable dilatation of the pupil, distortion of the countenance, a weak tremulous pulse, and eruption of petechiæ. On dissection, inflamed or gangrenous spots have been observed on the internal surface of the stomach, and the vessels on the membranes of the brain have appeared enlarged. Its baneful effects, like those of other vegetable narcotics, are best counteracted by a powerful emetic, and by drinking largely of the vegetable acids, or vinegar, that is, if it has been recently taken, for if it should have already entered the system, copious bleeding and purging should be had recourse to, administering, at the same time, acidulous drinks.

Henbane is one of the narcotics which has been longest known to physicians, having been employed by the ancients for mitigating pain, and restraining hæmorrhage. It had, however, fallen into disuse, until Dr. Stork of Vienna introduced it, with several other vegetable narcotics, to the notice of modern practitioners. He employed it in various spasmodic and painful diseases, as in epilepsy, hysteria, palpitation, headach, paralysis, mania, and schirrus. It was given in the form of the inspissated juice of the leaves, the dose of which is from one to two grains, which requires to be gradually increased. At present, it is principally employed as a substitute for opium, where the latter, from idiosyncracy, occasions any disagreeable symptoms, or where it is more peculiarly of importance to avoid its constipating effect: it is, however, not equal to opium as an anodyne in procuring remission of pain or irritation, and producing that soothing state of languid ease. In some forms of mania, more especially puerperal mania, it has been supposed preferable to opium, either alone or in combination with camphor. A tincture of it has been introduced into the Pharmacopœias, which affords a preparation probably more uniform in strength than the inspissated juice. Its dose is thirty or forty drops.*

Offic. Prep.—Succ. Spiss. Hyosc. N. Tinct. Hyosc. N. *Ed. Lond. Dub.*

Atropa Belladonna. Deadly Nightshade. *Pentand. Monogyn. Solanaceæ. Folia. Indigenous.*

This is an indigenous herb, often growing in waste and shady situations. Its leaves have scarcely any smell, and only a slightly nauseous, sub-acrid taste. The berries, which are purple, are sweetish. Both are highly narcotic, as is also the root, but the leaves are preferred for medicinal use, as being more uniform in strength. In a moderate dose, belladonna occasions a sense of warmth, followed by diaphoresis, and a disposition to sleep, frequently with nausea and headach; in a larger dose, symptoms of intoxication, vertigo, sickness, and thirst; the pulse becomes low and feeble, the pupils are dilated, the face becomes swelled, vision is impaired, and these symptoms terminate in convulsions, coma, or paralysis. On dissection, where it has proved fatal, the stomach and intestines have been found inflamed or gangrenous, and the blood in a dissolved state. The remedies are a powerful emetic in a sufficiently large dose, and dilution with the vegetable acids.

The leaves of this plant, according to Vauquelin, contain vegetable

* *Incompatible Substances.* Precipitates are produced by acetate of lead, nitrate of silver, and sulphate of iron—vegetable acids weaken its narcotic powers. Paris. *Ed.*

albumen, muriate, sulphate, binoxalate, nitrate, and acetate of potash; and Dr. Brandes lately detected an alkaline element in it, to which he gave the name of *atropia;* it forms distinct salts with the acids.

Belladonna was first employed as an external application, in the form of fomentation, to schirrus and cancer. It was afterwards administered internally in the same affections; and numerous cases in which it had proved successful, were given on the authority of the German practitioners. It has been recommended, too, as a remedy in extensive ulceration, in paralysis, chronic rheumatism, epilepsy, mania, and hydrophobia, but with so little discrimination, that little reliance can be placed on the testimonies in its favour; and in modern practice, it is not often employed. It appears to have a peculiar action on the eye; hence it has been used in amaurosis; and from its power of causing dilatation of the pupil, when topically employed under the form of infusion, it has been used before performing the operation for cataract,—a practice which is hazardous, as the pupil, though much dilated by the application, instantly contracts when the instrument is introduced. When given internally, its dose is from one to three grains of the dried leaves, or one grain of the inspissated juice.

Offic. Prep.—Succ. Spiss. Atrop. Bellad. *Ed.* Extract. Belladonnæ. *Lond.*

Aconitum Napellus. Aconite, Monk's-hood, or Wolfsbane. *Polyand. Trigyn. Multisiliquæ. Herba. Europe. America.*

The aconite which has been medicinally employed, is regarded by Wildenow, not as the aconitum napellus, but the aconitum neomontanum; and this has been admitted, on his authority, by the Dublin College, while the other is retained by the London College. The smell of its leaves, when recent, is narcotic, but is lost by drying. Their taste is sub-acrid. In a moderate dose its effects are those of a narcotic, accompanied with slight diaphoresis; in a larger dose it occasions vertigo, syncope, paralysis, and convulsions; when it is dried, its strength is liable to variation.

Aconite was employed by Stork in chronic rheumatism, exostosis, paralysis, ulceration, and scirrhus. Though highly praised, it has fallen almost entirely into disuse. Its dose is from one to two grains of the dried leaves; of the inspissated juice half a grain, this dose being gradually increased: it is chiefly in obstinate chronic rheumatism that a trial is sometimes made of it in modern practice.

Offic. Prep.—Succ. Spiss. Aconit. Napell. *Ed.* Extract. Aconiti. *Lond.*

Conium Maculatum. Cicuta. Hemlock. *Pentand. Digyn. Umbellatæ. Folia, Semen. Indigenous.*

This plant, which grows abundantly in this country in waste grounds, is of the umbelliferous kind. It is distinguished from other similar vegetables by its large and spotted stalk, by the dark green colour of the lower leaves, and by its peculiar faint disagreeable smell, which becomes more perceptible in the leaves when they are bruised. The seeds have a fainter odour, and are inferior in power. The root has similar powers, but varies in strength at different seasons. The leaves are therefore preferred for medicinal use. Orfila found the extract, prepared by boiling the dried powder in water, and evaporating, to be perfectly inert, as the active principle of the plant resides in a resinous element, insoluble in water.

Hemlock is a very powerful narcotic. Even in a moderate dose, it is

liable to produce sickness and vertigo; in a large dose it occasions permanent sickness, with great anxiety, dimness of vision, delirium, convulsions, and coma. The use of it was confined to external application, until it was introduced by Stork, principally as a remedy in scirrhus and cancer; and the beneficial effects obtained from it were in many cases so conspicuous, than sanguine expectations were formed of its efficacy. Its effects, when it is first administered, often appear to sanction such expectations; in cancerous ulceration in particular, the pain abates, and the discharge becomes less copious and acrid, and the ulcer frequently contracts in size, and shows a disposition to heal.

These advantages, however, are usually only temporary, or cannot be carried beyond a certain extent; and though many cases were related by Stork and others, of permanent cures having been obtained from it, there is much reason to believe that its efficacy was exaggerated. It is now regarded only as a palliative, but, still considering it even as such, it is a valuable remedy: it relieves the pain, and corrects the discharge even more effectually sometimes than opium, and it is not liable to occasion the disagreeable consequences which arise from that narcotic. And when opium is employed, hemlock is a valuable auxiliary, as it renders a smaller quantity of the former necessary.

Benefit is derived frequently from cicuta in other cases of extensive ulceration; particularly in those connected with a scrofulous taint; it promotes too the operation of mercury in healing venereal ulcers, and is useful in those forms of ulceration which arise under the action of mercury, and which are aggravated instead of being removed by its protracted use; occasionally too, it seems to contribute to the removal of glandular obstruction and induration.

Cicuta is given either under the form of the dried leaves, or of the juice of the fresh leaves inspissated by a gentle heat to the consistence of an extract, the former being given in a dose of two or three grains, the latter in a dose of two grains. The dose of either requires to be increased, and that more quickly, and to a greater extent, than is the case with almost any other substance in the Materia Medica, so that at length it has been taken to the extent of a number of drachms in the course of the day. The inspissated juice is a preparation on the operation of which we can never depend; hence it is seldom used; and even the powder of the dried leaves is liable to be variable in strength. Its pharmaceutic treatment, therefore, is of much importance. The leaves ought to be collected when the flowers are about falling off; they ought to be dried before a gentle fire, be reduced to powder as soon as they are dried, and kept in small phials carefully secluded from the air and light. The proofs of their proper preparation, and of their activity, are the powder being of a lively green colour, and retaining the peculiar odour of the plant.

The recent leaves are sometimes applied externally to painful or ill-conditioned ulcers, or a cataplasm for the same purpose may be formed from the dried powder mixed with crumbs of bread.*

Offic. Prep.—Succus. Spiss. Conii Macul. *Ed. Dub.* Extract. Conii. *Lond.*

DIGITALIS PURPUREA. *Foxglove. Didynam. Angiosperm. Solanaceæ. Folia. Indigenous.*

THIS indigenous plant grows on dry elevated situations, and from the

* *Incompatible Substances.* The energies of conium are greatly diminished by vegetable acids; hence vinegar is its best antidote. Paris. *Ed.*

beauty of its flower, has often a place in our gardens. All the parts of it are powerfully narcotic, but the leaves being most uniform in strength, are preferred for medicinal use. They are large and oblong, of a green colour, rather dark, have little smell, and a bitter somewhat acrid taste. They are collected when the plant is in blossom, and are dried before a gentle fire, the thicker stalks being removed: and they ought to be kept without being reduced to powder. Both water and alcohol extract their active matter by infusion.

The operation of digitalis on the system is very peculiar, and there is even considerable difficulty in ascertaining its real effects. From a small dose there is little sensible effect, until after its continued administration. In a full dose, it produces exhaustion of power, marked by a great and sudden reduction in the force of circulation; the pulse being reduced both in frequency and force, falling sometimes from 70 to 40 or 35 beats in a minute, and being small, tremulous, and often intermitting. This is accompanied with sickness, anxiety, a sense of faintness, vertigo, dimness of vision, and, in a large dose, with vomiting, syncope, coldness of the extremities, convulsions, and coma, with sometimes a fatal termination. Yet these effects are not uniform, but even from the same dose there is considerable diversity of operation in different individuals: the pulse is sometimes rendered slower, without being diminished in fulness; at other times it is rendered irregular, and under the operation of foxglove it appears to be peculiarly liable to be affected by slight muscular exertion, or by trivial causes of irritation. The sickness does not always accompany the reduction of the force of circulation. Sometimes none of these effects, and scarcely any perceptible change in the state of the functions, are immediately apparent; but if the dose be continued, they are suddenly produced.

Effects are even observed from the operation of foxglove apparently of a very opposite kind. While it reduces the force of the circulation, it appears to increase the action of the absorbent system, and hence it proves a powerful remedy in dropsy; and Dr. Withering, by whom its powers were first particularly investigated, observed, that when given in a state of disease, it was most successful not where there existed increased action in the system, but, on the contrary, in states of debility, where the pulse was feeble and intermitting, and the countenance pale. Other authors have remarked its apparent stimulant operation; and Dr. Sanders, from a series of observations and experiments, has inferred, that it always acts primarily as a stimulant, augmenting, when given in a dose not too large, the force and frequency of the pulse, and inducing a state of increased action; it is only when the dose is too large, or when it is accumulated by repetition, that reduction of the force of the circulation and other symptoms of diminished power are produced; and hence, according to this view, it is analogous in its operation to other narcotics.

It must be admitted, however, that it is more difficult to regulate its administration so as to obtain its continued stimulant operation, than it is with regard to other stimulants; that there is a rapid transition to a state of diminished action; and that this is greater, and more permanent, compared with the primary stimulant effect, than in other stimulants, even of the most diffusible kind.

Foxglove, producing very different effects according to the mode in which it is administered, or according to the state of the system, is employed as a remedy in different diseases. Under the present class, those

applications are to be considered, which appear to be connected with its action as a narcotic.

On this, in part at least, has been supposed to depend the advantage derived from it as a remedy in phthisis. When given to that extent in which it reduces the velocity and force of the circulation, it proves useful, by counteracting that state of increased action which prevails in the incipient stage of the disease; and by diminishing the rapidity of the circulation through the lungs, it may facilitate the removal of the local affection. In the more advanced stages, it may operate, it has been conceived, by promoting absorption, thus removing the tuberculous affection, or withdrawing the purulent matter, before it has been rendered acrid by the action of the air. Sanguine expectations were at one period formed of the advantages to be derived from it in the treatment of phthisis, many of the symptoms disappearing under its use, and the progress of the disease appearing to be arrested. The change of organic structure is, however, so considerable, at least in the advanced state of the disease, as scarcely to admit of a cure from the operation of any remedy: and in the earlier stages, where some degree of inflammatory action exists, it is difficult to give digitalis so as to reduce the force of the circulation, and continue this effect, without inducing other consequences, which compel us to relinquish its use.

Foxglove has been proposed as a remedy in pneumonia, from its power of reducing the force of the circulation when given in a sufficient dose, conjoined with blood-letting; and cases have been related of the success attending the practice, while some authors have condemned it as hazardous, from the excitement it is liable to produce. On a similar principle, it has been proposed to be employed in croup.

In active hæmorrhage, it might be expected, from the same operation, to be a remedy of much power; and, according to the observations of Ferriar and others, it may be employed with signal advantage in epistaxis, hæmoptysis, and menorrhagia, either alone or with opium.

In spasmodic asthma, the combination of it with opium has afforded much relief. In palpitation arising from intemperance, or from passions of the mind, and not connected with dyspepsia, the irregular action of the heart has been abated, and at length removed by its operation.

Foxglove is given in substance, or under the form of infusion, decoction, or tincture. The medium dose of the powder of the dried leaves is half a grain; the dose of the infusion, prepared according to the formula in the Edinburgh Pharmacopœia, is half an ounce; that of the tincture is fifteen drops; these quantities being given twice a-day The decoction is an improper form, as being variable in strength. The tincture is the form under which it has usually been given as a narcotic; the infusion that in which it has been employed as a diuretic. When it is given in substance, there is supposed to be more risk of its effects accumulating from repetition of the dose, so as to induce the unpleasant symptoms which arise from an over dose.

To obtain the full narcotic operation of foxglove, the dose given at first requires to be gradually increased, but this increase must be made with much caution, not only from the hazard attending an over dose, but from the circumstance that the action of the remedy is for a time not apparent; but if the dose is too quickly increased, or repeated at intervals not sufficiently distant, it appears suddenly, and continues progressive. Hence the necessity of the practitioner's watching with the greatest attention the

effect it produces. If the dose given at first is small, the augmentation may proceed at the rate of from one-eighth to one-fourth of the original quantity every second day, and the dose should not be repeated more than twice, or at farthest thrice a-day, unless in acute diseases, where the effect must be more speedily obtained, and where, therefore, the augmentation must be more rapid. The administration of the remedy is continued until the effect intended to be obtained is produced, or until its operation is apparent on the system; whenever the pulse begins to diminish in frequency or force, the increase of dose must be stopt; and if the reduction be considerable, or proceed rapidly, the administration must be suspended, and, only after a sufficient interval, cautiously renewed. This is more especially necessary when the pulse becomes intermitting, or when nausea is induced, with dimness of vision, vertigo, or any tendency to fainting. When these symptoms do occur, they are best obviated by small doses of stimulants, warm wine, brandy and water, with aromatics, ether, and spirit of ammonia; some have recommended strong bitter infusions, doses of opium, and a blister applied to the region of the stomach.

The infusion of foxglove has been applied externally as an anodyne lotion to painful cutaneous eruptions, or ulceration. An ointment composed of the powder mixed with lard, has been found successful in obstinate tinea capitis.

The application of foxglove, as a diuretic, will be considered under the class of diuretics.*

Offic. Prep.—Infus. Digit. P. Tinct. Digit. P. *Ed. Lond. Dub.* Decoct. Digit. *Dub.*

NICOTIANI TABACI FOLIA. Tobacco. *Pentand. Monogyn. Solanaceæ. Folia. America.*

THIS plant, though cultivated in this country, is usually imported from America. Its leaves which are of a large size, are of a light green colour, which they retain with little change when dried; but in the usual preparation to which they are subjected, they are rendered brown by the action of a little sulphate of iron. Their smell is fœtid, their taste extremely bitter and acrid. They deflagrate in burning, from a quantity of nitre they contain. Their active matter is extracted both by water and by alcohol; by decoction its activity is much impaired. The essential oil obtained from them by distillation is very highly narcotic, so that when introduced into a wound, or injected into the rectum, it occasions instant death. According to Vauquelin, a peculiar acrid principle exists in tobacco, volatile, and soluble both in water and in alcohol. It has been called Nicotin.

Tobacco operates as a very powerful narcotic. This is apparent even in the common practices of smoking and chewing it, though its effects, like those of other narcotics, become less powerful from continued use. In a person unaccustomed to it, or in an over dose, it excites severe and permanent sickness, with vomiting, reduces the force of the circulation, and occasions extreme muscular debility, with insensibility, cold sweats, and convulsion. The singularity has already been remarked, under the general view of the operation of narcotics, that the infusion of tobacco not

* *Incompatible Substances.* When added to the Infusion of Digitalis, precipitates are formed by sulphate of iron, and the infusion of yellow cinchona. Paris. *Ed.*

only affects the nervous system, but acts powerfully on the heart, causing its contractions to cease, while the essential oil has no such effect.

As a diffusible stimulant, the smoke of tobacco, thrown into the rectum, was at one time employed in the recovery of drowned persons,—a practice proved to be prejudicial, and now exploded. The same practice is occasionally employed in ileus and incarcerated hernia; in the former disease, with the view of removing the constricted state of the intestines; in the latter, with the intention of producing that state of muscular relaxation which may favour the reduction of the protruded intestine. Though not without hazard, it has sometimes proved successful. The watery infusion of the strength of one drachm of the dried leaves to a pound of tepid water, is a more convenient form of employing it than the smoke, as an enema; and even the infusion of this strength has sometimes produced alarming symptoms of exhaustion. Unless it be used, however, in such a state of activity, as to produce some degree of muscular debility, no advantage can be derived from it; and the practice is therefore only to be had recourse to, where other methods have failed. The smoke of tobacco received into the mouth, relieves the pain of toothach, either by its narcotic power, or by exciting a profuse salivary discharge. It sometimes, too, by its action on the lungs, relieves the paroxysm of spasmodic asthma. The powder is in common use as an errhine. The infusion or decoction is sometimes used as an emetic, but its operation is harsh, and accompanied with severe sickness. In small doses, tobacco excites the urinary secretion, probably by promoting absorption. The medicated wine is the form under which it has been used as a diuretic, in dropsy and dysuria, its dose being 30 drops. The leaves bruised, or moistened, have been employed as a fomentation or cataplasm, in tinea capitis, and in various cutaneous eruptions; incautiously applied, they have sometimes occasioned the violent effects which arise from the internal administration of tobacco in too large a dose.

Offic. Prep.—Vin. Nicot. Tab. *Ph. Ed.*—Infus. Tab. *Lond.*

Lactuca Virosa. Strong-scented Lettuce. *Syngenes. Polygam. æqual. Compositæ. Folia. Indigenous.*

The leaves of this plant have a strong fœtid smell, similar to that of opium, and yield a white juice, in which their activity resides. Their taste is bitter and acrid. Though narcotic, they have been used principally from their diuretic power in the treatment of dropsy, under the form of the inspissated juice. The dose of this is 5 or 10 grains, which is gradually increased to 1 or 2 drachms in twenty-four hours. By the German practitioners, by whom this plant has been recommended, it has also been used in palpitation of the heart, and in intermittent fever.

Offic Prep.—Succ. Spiss. Lact. Vir. *Ed.*

Lactuca Sativa. Garden Lettuce.

This species of lettuce is generally cultivated, and from the leaves and stem of it, which contain a pellucid colourless juice, an extract is obtained. This juice is somewhat of a milky appearance, but upon exposure to the atmosphere, it assumes a brown hue. Lactucarium, as the extract has been named, resembles opium in taste and odour, as well as in narcotic properties; and from analysis it appears to contain the same narcotic principle, morphium, discovered first by Serturner in opium.

It was proposed by Dr. Cox of Philadelphia, as a substitute for opium;

and Dr. Duncan sen. to whom we are more particularly indebted for its introduction among us, from a very extensive and accurate observation of its narcotic effects, recommends it as highly beneficial in allaying the cough accompanying phthisis pulmonalis. Many other medical men have confirmed its utility in similar cases.

Offic. Prep.—Succ. Spiss. Lact. Sativ. *Ed.*

DATURA STRAMONIUM. Thorn-Apple. *Pentand. Monog. Solanaceæ. Herba. Indigenous.*

THORN-APPLE is an indigenous herb, the leaves of which have a narcotic odour, and bitter taste. They contain an alkaline principle called Daturia. They possess the powers of a narcotic, producing, when taken in too large a quantity, vertigo, sickness, delirium, and convulsions. With other plants of the same family, stramonium was made the subject of clinical experiments by Stork; and it was recommended by him as a remedy in convulsive diseases, especially in epilepsy, and in mania. The form in which it has been given is that of the inspissated juice of the leaves, the dose of which is from 1 to 3 grains twice a-day gradually increased. The herb or the root smoked like tobacco, has been found to afford relief in the paroxysm of spasmodic asthma. The smoke is drawn into the lungs as fully as possible, from a common tobacco-pipe, continuing the smoking until the quantity is consumed, and repeating this occasionally and frequently if necessary. It often excites some degree of vertigo, usually promotes expectoration, and relieves the cough, dyspnœa, and spasmodic irritation.

ARNICA MONTANA. Leopards-Bane. *Syngenes. Polygam. superf. Compositæ. Flores, Radix. Germany.*

THE flowers of this plant have a smell slightly fœtid, and a penetrating bitter taste; both taste and smell are extracted by maceration in water. In their action on the system, their stimulating power is apparent along with their narcotic action; they increase the force of the vascular system, and appear to communicate tone to the muscular fibre. In a larger dose, they produce vomiting and purging, sometimes followed by muscular pains, vertigo, and convulsions. They have been used in amaurosis, paralysis, convulsive disorders, gout, and rheumatism. The dose is 5 grains in substance dried, or half a drachm in infusion.

The root of arnica is aromatic and tonic, and has been used as a substitute for Peruvian Bark.

RHODODENDRON CHRYSANTHUM. Yellow-flowered Rhododendron. *Decand. Monogyn. Bicornes. Folia. Siberia.*

THE leaves of this shrub are destitute of smell, but have a bitter, rough, and sub-acrid taste, which they communicate to water by infusion or decoction. They are stimulating and narcotic, and occasion in a small dose increased vascular action; in a large dose intoxication and delirium. They have been employed in chronic rheumatism and gout, their application in the former disease having been derived from the practice of the natives of Siberia. Their power is said to be marked by a sensation of creeping in the skin, and by a diaphoresis being induced. The form in which they have been given is decoction, 2 drachms being boiled in 10

ounces of water, and 1 or 2 ounces of the strained liquor being given twice a-day, and gradually increased.

Rhus Toxicodendron. Poison Oak. *Pentand. Trigyn. Dumosæ. Folio. North America.*

This plant has so much acrimony, that the touching of the leaves, or rubbing them on the skin, occasions itching, inflammation, and desquamation; if taken internally, nausea, vertigo, and pain in the head are produced. The dried leaves have been used in paralysis, in some cases related by Mr. Alderson, with marked advantage. The dose given was half a grain twice or thrice a day, and gradually increased to three or four grains daily. It excited a sense of heat, and irregular motions in the parts affected.

Humulus Lupulus. *Hop. Dioecia. Pentand. Scabridæ. Indigenous.*

This plant is cultivated in England, its strobiles being used to give bitterness to fermented malt liquors. They are picked off when ripe, and are dried by artificial heat. They have an odour somewhat fragrant and aromatic, and a taste very bitter, with some astringency; these qualities are extracted by water by infusion; by decoction the aromatic flavour is lo-t; by distillation with water, a portion of essential oil is obtained. It appears to contain resin, extractive matter, mucilage, volatile oil, tannin, an ammoniacal salt, and a bitter principle.* Hop, along with its bitterness, has a narcotic power; of this the popular remedy, sometimes successful, of a pillow of hops to procure sleep in the delirium of fever and in mania, is a proof. It accordingly, when given internally in a full dose, reduces the frequency of the pulse, and procures sleep. It has been employed as an anodyne, principally in rheumatism and in the paroxysm of gout, either in substance, in the dose of three grains, or under the form of infusion or tincture, the latter being given in the dose of from half a drachm, to a drachm, once or twice a-day. An extract prepared by inspissation of its decoction, is also given in a dose of five or seven grains. An over-dose occasions headach and vertigo. A cataplasm or ointment, prepared from it, has been used as an anodyne application to cancerous sores; and a fomentation of the strobile has been used in the same case, and as an application to painful tumours.

Offic. Prep.—Tinct. Humul. *Ed. Lond.* Extr. Humul. *Ph. Lond.*

Strychnos Nux Vomica. Vomica Nut. *Pentand. Monogyn. Solanaceæ. East Indies.*

The kernel of the fruit is the part of this plant that is powerfully narcotic; its taste is intensely bitter; it has little or no smell, and is so hard that it cannot be reduced into powder by beating, but requires to be filed down. Its narcotic operation is well exemplified in the effect it produces when given as a poison to dogs and other animals. It occasions extreme anxiety, paralysis of the hinder extremities, convulsions, and death; and on dissection, no marks of local affection are to be discovered in the stomach.

* From the researches of Dr. Ives, of this city, it appears that the virtues of the Hop reside exclusively in the yellow impalpable powder which has generally been considered as the *pollen*, but which Dr. Ives considers to be a peculiar secretion from the nectaria. To this secretion he has given the name of *Lupulin*. See the American Journal of Science and the Arts, Vol. 2. p. 302. *Ed.*

In analysing this substance, M. M. Pelletier and Caventou discovered a peculiar proximate principle, of an alkaline nature, and in which the activity of the medicine resides; they have called it Strychnine. It is obtained in the following manner:—a portion of the raspings of the bean was heated under pressure with sulphuric ether, a green oily fluid then separates, which is to be poured off, and the residuum is to be treated with alcohol; a very bitter yellowish-brown substance is thus obtained, soluble in water and alcohol. This is to be boiled with pure magnesia and filtered, the strychnine and magnesia remaining in a state of mixture on the filter, after the colouring matter has been washed off. By the addition of alcohol, the strychnine is obtained in a state of great purity. This substance, strychnine, possesses highly alkaline properties; it is soluble in alcohol, and nearly insoluble in water; its solution is very bitter and poisonous; it crystallizes in very small four-sided prisms: it has no smell; taste intensely bitter, with slight metallic flavour; it is neither fusible nor volatile, but is decomposed at about 600°, into substances consisting of oxygen, hydrogen, and carbon.

Strychnine unites with the acids, forming neutral salts; and is said to exist in the nux vomica combined with an acid somewhat resembling the malic, but which Pelletier has termed the Igasuric.

As a narcotic, it has been recommended in mania, epilepsy, and hysteria, but it has scarcely been employed. More lately, however, it has been employed by the French physicians with great success in cases of paralysis. It has been given in dysentery and intermittent fever, in a dose of 5 grains twice a-day; but the use of it is so hazardous, that it has not been established in practice, nor received into the Pharmacopœias.

Prunus Lauro-Cerasus. Cherry-Tree Laurel. *Icosand. Monog. Pomaceæ. Folia. Europe.*

The leaves of this plant have an odour slightly fragrant; their taste is extremely bitter. They possess a highly narcotic quality, which is extracted by infusion in alcohol or water, and is even brought over by distillation; the distilled water is narcotic, and a small quantity of essential oil may likewise be procured, possessed of the same property. The very singular fact has been established, that the volatile principle in which the narcotic quality of this plant resides is the prussic acid. It had often been observed, that the odour of this acid is similar to that of the cherry laurel, peach blossom, and bitter almond. Bohn found, that the distilled water of the bitter almond contains prussic acid. Schroeder discovered it in the distilled water of the peach blossom and cherry laurel, prussiate of potash being obtained by distilling them from the alkali; and Bucholz succeeded in separating the prussic acid from the essential oil of the cherry laurel by agitation with an alkaline solution. This acid in its pure state has been further found to be highly narcotic; and the narcotic power of all these plants, no doubt, depend on its.

They afford a curious example of the existence, in the vegetable kingdom, of a substance which had before been regarded as a product only of an artificial process, and which, formed by the decomposition of animal substances, resembles them in chemical constitution; and the volatility of this acid not less explains the singular fact of a high degree of narcotic power belonging to a distilled water of plants, or an essential oil.

The narcotic power of the prussic acid artificially prepared is so great,

that even smelling the vapours occasions vertigo, spasmodic constriction of the bronchiæ, and other deleterious effects. Animals respiring it, by merely being held over a vessel in which it is contained, immediately expire. In its concentrated liquid state, it occasions death when swallowed in the quantity of a few drops.

The distilled water of the cherry laurel has long been known as a poison; it speedily kills small animals, and it effects are those of a pure narcotic. The noxious operation of the plant is also sometimes displayed in the effects of those spirituous cordials to which it has been added to communicate flavour. It has not been employed in medicine, but a cataplasm prepared from the leaves has been used as an anodyne application to painful tumours and ulcers.

CHAP. IV.

ANTISPASMODICA.—ANTISPASMODICS.

It is not easy to assign precisely the differences in kind of action between Narcotics and what are named Antispasmodics. The effects they produce are similar; they are capable of exciting the actions of the system, and they are often equally powerful in allaying pain and inordinate muscular action. But antispasmodics act less powerfully, and they do not in general produce that state of insensibility and diminished power which follows the application of narcotics. This might be supposed owing to a mere difference in strength: yet there seems also to be something farther than this, since antispasmodics produce no such effect in any dose, and since, although they are so much inferior to narcotics in this respect, they are sometimes equal in repressing inordinate and irregular muscular action. The difference has been explained on the supposition, that as stimulants they have less diffusibility and greater durability of action; or else, that with their stimulant operation, they have no direct power of diminishing the powers of the system. Considered under either view, they form an intermediate class between narcotics, which are so highly diffusible, and tonics, which are much more permanent in their stimulant operation; and experience shews, that they partake of the properties of both; several narcotics and tonics are frequently used as antispasmodics; and the powers of the principal antispasmodics, in obviating spasmodic affections, are apparently connected principally with their stimulant power

From the name given to this class, their medicinal applications may be understood. Spasm consists in irregular muscular contraction; somteimes the contraction is permanent; at other times it alternates with relaxation, but even then both are performed more quickly, and the contractions are more powerful and permanent than natural. Many diseases depend on spasmodic action, and others are accompanied with affections of this kind, The medicines which obviate and remove such a state are termed Antispasmodics.

Spasm may originate from various causes. One of the most frequent is a strong irritation, continually applied, such as dentition, worms, or the presence of any foreign substance in wounds, the effect of this irritation

being extended more or less to the nervous system, or to the voluntary muscles. Excessive irritability must give rise to similar effects. In such cases, narcotics must prove useful by diminishing irritability and sensibility. Sometimes spasm appears to arise from mere debility, as is exemplified in the convulsive motions in an animal exhausted by hæmorrhage or other debilitating causes, and the obvious means of removing it, when it arises from this cause, is by the use of tonics. Both narcotics and tonics, therefore, are occasionally useful as antispasmodics; such, for example, as opium and ether belonging to the one, and zinc, mercury, and Peruvian bark to the other; and these are in common practice regarded as belonging to this class. But there are farther several substances which cannot be with propriety referred to either of these divisions, as musk, castor, assafœtida, galbanum, valerian; they are in some measure intermediate; though their specific operation cannot be very well explained. It is to these that the name of Antispasmodics is more exclusively appropriated.

Few general observations can be made on this class of medicines. Hysteria, chorea, epilepsy, hydrophobia, cholera, singultus, palpitation of the heart, and asthma, are the principal diseases in which they are employed. As their effect is not very permanent, they require to be given during the paroxysm of the spasmodic disorder, or a short time before its approach. For the same reason, the dose requires to be frequently repeated. Those, however, which belong to the class of tonics, require an opposite mode of administration; their beneficial effects being obtained only from their continued use. Some of those more strictly antispasmodics, stimulate the general system, and render the pulse more frequent: but in general their sensible operation is not very apparent; they can scarcely be regarded as medicines of much power, and even in removing spasmodic affection, are inferior to some of the narcotics, particularly to sulphuric ether, or opium. Narcotics and tonics are indeed the most powerful antispasmodics.

ANTISPASMODICS.

Moschus.	Ferula Assafœtida.
Castoreum.	Bubon Galbanum.
Oleum Animale Empyreumaticum.	Sagapenum.
Succinum, Oleum et Acidum Succini.	Valeriana Officinalis.
Bitumen Petroleum.	Crocus Sativus.
Carbonas Ammoniæ Pyro-oleosus.	Malaleuca Cajuputi.

NARCOTICS USED AS ANTISPASMODICS.

Ether. Camphor. Opium.

TONICS USED AS ANTISPASMODICS.

Cuprum. Zincum. Hydrargyrus. Cinchona.

Moschus. Musk. Moschus Moschiferus. *Cl. Mammalia. Ord. Pecora. Asia.*

The animal which affords musk is a native of the elevated regions of the East of Asia. The musk appears to be a peculiar secretion, which is deposited in a small sac, situated near the umbilicus of the male. It is brought from China, or from India, in its natural receptacle, a small membranous bag covered externally with coarse hair. The musk within is in

grains, slightly unctuous, of a black colour, having a very strong durable smell, and a bitter taste. It yields part of its active matter to water, by infusion; by distillation the water is impregnated with its flavour; alcohol dissolves it, the impurities excepted. It consists of resin combined with volatile oil, a mucilaginous extractive matter, with small portions of muriate of ammonia, phosphate of soda, albumen, and gelatine.

Musk is an antispasmodic supposed to be of considerable power; it is administered occasionally in a number of spasmodic diseases, especially hysteria, epilepsy, and singultus, and also in diseases of debility. In typhus fever it is employed to relieve subsultus tendinum, and other symptoms of a spasmodic nature. In cholera, it is given with the view of checking vomiting. In retrocedent gout it is employed as a stimulant. Combined with ammonia, it has been celebrated for its power of arresting the progress of gangrene. Its efficacy in some of these affections has undoubtedly been exaggerated; and from this, as well as from its high price, it is at present not very often employed. Its dose is from 6 to 20 grains, repeated, if necessary, every five or six hours. It is best given in the form of bolus. To children, it has been given under the form of enema, as a remedy in the convulsions arising sometimes from the irritation of dentition.*

Offic. Prep.—Mist. Mosch. *Lond.*—Tinct. Mosch. *Dub.*

CASTOREUM. Castor. Castor. Fiber. *Mammalia. Glires.*

THE beaver, an amphibious quadruped, is a native of the North of Europe, Asia, and America. Castor is a peculiar product collected in membranous cells near the extremity of the rectum, in this animal. The follicles inclosing it are cut off, and dried by exposure to the smoke of fuel. The castor, which is naturally soft and oily, becomes hard. It is imported of superior quality from Russia; an inferior kind is brought from New England. The former is dry, slightly unctuous, of a reddish brown colour, intermixed with fibres, and covered with a tough membrane; it has a strong unpleasant smell, and a bitter acrid taste. The American castor is more shrivelled, and inferior in taste and smell. The active matter of castor is dissolved by alcohol, proof-spirit, and partially by water; the tincture with alcohol is the least nauseous.

Castor is used as an antispasmodic, in hysteria principally, sometimes in amenorrhœa, in a dose from 10 to 20 grains, or from one to two drachms of the tincture. From the experiments of Dr. Alexander, it appears to be a remedy of no power, as, given in a quantity much larger than its usual dose, it produced no sensible effect on the system.

Offic. Prep.—T. Castor. *Ph. Ed. Lond. Dub.* T. Castor. Comp. *Ed.*

OLEUM ANIMALE EMPYREUMATICUM. Empyreumatic Animal Oil. Ol. Cornu Cervi.

THE fresh bones or horns of animals, when exposed to heat in close vessels, afford an empyreumatic oil, derived from new combinations of the elements of the animal matter which is attached to the phosphate of lime, the base of bone. This oil is at first of a thick consistence, black colour, and fœtid smell, but by repeated distillation becomes thinner, colourless, and transparent, though it remains still fœtid. In this state it has been

* *Incompatible Substances.* The solutions are decomposed by oxymuriate of mercury; sulphate of iron; nitrate of silver; and the infusion of yellow bark. Paris. *Ed.*

used as an antispasmodic, in a dose of 10 or 15 drops. It retains its place in the Dublin Pharmacopœia, under the name of Oleum Cornu Cervini Rectificatum, being obtained in the process of the distillation of hartshorn or bones, for the preparation of carbonate of ammonia; but it is entirely discarded from practice.

Succinum. Oleum et Acidum Succini.

The bituminous substance, amber, though it has a place in the list of the Materia Medica of the different Pharmacopœias, is perfectly inert, and is introduced only as affording, by distillation, an empyreumatic oil, which has been applied to some medicinal uses. This oil is at first thick and of a dark brown colour; but by repeated distillations with water it becomes limpid, still retaining, however, a very fœtid odour. It has been celebrated for its antispasmodic power, and has been employed in hysteria and amenorrhœa in a dose of from 10 to 15 drops. It is now discarded from practice, or is used only as an external stimulating application in paralysis and chronic rheumatism.

Along with this oil, a concrete acid is produced in the distillation, which is at first impure, but is purified by sublimation, or by solution and crystallization. It has a place in the Edinburgh and Dublin Pharmacopœias, but is destitute of any medicinal power, and is never applied to any use; its crystals are soluble in twenty-four parts of water, and have a slightly acid taste; they are also volatilized by heat.

Bitumen Petroleum. Petroleum Barbadense. Mineral Tar.

Various kinds of liquid bitumens exist as natural productions, of different degrees of thickness, of a colour more or less deep, and more or less volatile. That which has been usually kept in the shops, under the name of Barbadoes Tar. is thick, of a dark brown colour, having a smell that is fœtid, and a warm bitter taste. It has an analogy to the preceding empyreumatic oils in its properties; and like them has been used as an antispasmodic and expectorant in asthma and chronic catarrh, and externally as a stimulating application in rheumatism and paralysis. Though it retains its place in the Pharmacopœias, it is scarcely ever used.

Sub-Carbonas Ammoniæ Pyro-Oleosus. Empyreumatic Sub-Carbonate of Ammonia. Sal Cornu Cervi.

The bones of animals, when exposed to a sufficient degree of heat, afford a large quantity of sub-carbonate of ammonia, formed by new combinations of the elements of the animal matter contained in the bone. There is a similar production of empyreumatic oil, and with this oil the ammoniacal carbonate is always impregnated, whence it derives a peculiar fœtid odour. It has also been supposed to derive from it certain medicinal powers, and has been used in preference to the pure sub-carbonate of ammonia as an antispasmodic. Having been first procured from the bones of the deer, it has retained the name of Sal Cornu Cervi; being procured dissolved in the water which distils over, and this being rectified by repeated distillations. When thus rectified, it differs in little from pure sub-carbonate of ammonia; and even combined with the empyreumatic oil, it has probably no additional medicinal efficacy, while from its fœtor it is unpleasant. Pure ammonia, dissolved in alcohol, is used as a solvent of the active matter of castor, assafœtida, and other antispasmo-

dics, on the supposition that it coincides with them in their action on the system.

Ferula Assafoetida. Assafœtida. *Pentand. Digyn. Umbellatæ. Gummi-Resina. Persia.*

Assafoetida is a concrete gum-resin, obtained by exudation from incisions made in the roots of the plant; the juice, after it exudes, being inspissated by exposure to the sun. It is in small masses, of a variegated texture, yellow on the external surface, white within, having an extremely fœtid smell, and a taste bitter and sub-acrid. It consists of sixty parts of extractive, according to Brugnatelli, thirty of resin, and ten of essential oil, its taste and smell residing in the resinous part. It yields all its virtues to alcohol. Triturated with water, it forms a milky-like mixture, the resin being diffused by the medium of the gum. Distilled with water, it affords a small quantity of essential oil, extremely fœtid.

Assafœtida is used as an antispasmodic in different nervous diseases, especially in amenorrhœa, hysteria, dyspnœa, dyspepsia, attended with flatulence, and tympanitis, and is regarded as superior in efficacy to any of the fœtid gums. Its usual dose is from 5 to 20 grains, in the form of pill, or diffused in water: it usually proves slightly laxative, and to obtain any advantage from it requires its continued use. It is likewise given under the form of enema, in tympanitis, flatulent colic, in the violent hysteric paroxysm, and as a remedy against worms, 2 drachms being diffused in 8 ounces of warm milk or water: it is sometimes too applied as a plaster.

Offic. Prep.—Emp. Assafœt. Pil. Assafœt. Comp. Tinct. Assafœt. *Ed.*—Mist. Assafœt. *Lond. Dub.* Enem. Fœtid. *Dub.*

Bubon Galbanum. Galbanum. *Pentand. Digyn. Umbellatæ. Gummi Resina. Africa.*

The plant which affords this resinous substance is a native of Syria, and also of the Cape of Good Hope. The Galbanum is obtained in the form of a milky juice, by exudation from incisions in the stem of the plant; when hardened it is in the form of a mass somewhat variegated in its texture, tenacious, of a yellowish brown colour, having a smell somewhat fœtid, and a bitter acrid taste.

Alcohol dissolves its resin, in which its powers have been supposed to reside; proof-spirit dissolves it entirely, the impurities excepted. Triturated with water, it is diffused, and forms a milky-like fluid; by distillation it affords about one-twentieth of its weight of essential oil. The following is its composition as given by M. Meisner:—

Resin, 65.8. Gum, 22.6. Cerasin, 1.8. Malic acid, volatile oil, and vegetable debris, 6.4. Loss, 3.4.

Galbanum has the virtues of the fœtid gums, and is used for the same purposes, and sometimes combined with them in hysteria and amenorrhœa; being inferior in strength, however, to assafœtida, it is less employed. It is slightly laxative, and is sometimes used as an aperient: it is employed too as an expectorant with myrrh and ammoniac, to check effusion from the mucous glands of the lungs. Its dose is 10 grains. Externally, it is more frequently used as a discutient to indolent tumours, and as a stimulant to promote suppuration.

Offic. Prep.—Emplast. Gummos. *Ed.* Pil. Galb. Comp. *Lond.* Tinct. Galban. *Dub.* Emp. Galb. Comp. *Lond. Dub.*

Sagapenum. *Gummi-Resina.*

This gum-resin, usually imported from Alexandria, is the produce of an unknown tree, said to be a native of Persia. It is in small masses, of a yellow colour, having a smell slightly fœtid, and a nauseous taste; it is soluble in proof-spirit: by distillation it affords a small quantity of essential oil. Its virtues and uses are the same as those of the assafœtida, to which, however, it is inferior in power, and is therefore seldom employed. Its dose is from 10 to 20 grains. It is sometimes applied externally as a discutient.

Valeriana Officinalis. Wild Valerian. *Triand. Monogyn. Aggregatæ. Radix. Indigenous.*

The root of this plant, which is the part of it used in medicine, consists of slender fibres twisted and attached to one head, of a light brown colour, having a smell strong and unpleasant, and a warm bitter taste, the smell and taste being stronger in wild valerian than in that which is cultivated. Its active matter is dissolved equally by water and alcohol, and appears therefore to consist of extractive matter, with perhaps a small portion of tannin, as its infusion changes colour on the addition of sulphate of iron. By distillation, water is impregnated with its flavour, but not with its taste, and scarcely any essential oil is obtained

Valerian is an antispasmodic, not unfrequently employed in modern practice, especially in hysteria, chorea, and epilepsy, where these depend not on organic derangement, or any permanent irritation, but on increased susceptibility of the nervous system. Sometimes, also, it is used with advantage in hemicrania. Its dose is from one scruple to one drachm, three or four times a-day, which is increased gradually as far as the stomach can bear it. Sometimes it is taken under the form of infusion, or of tincture. It appears upon the whole to be a remedy of little power.*

Offic. Prep.—Tinct. Valer. Ammon. *Ed. Lond. Dub.* Tinct. Valer. *Ph. Lond. et Dub.* Extr. Valer. Infus. Valer. *Dub.*

Crocus Sativus. Saffron. *Triand. Monogyn. Liliaceæ Floris Stigmata. Indigenous.*

This plant is cultivated in the South of England to afford the Saffron to the shops. The stigmata which crown the pistil of the flower are separated from the other parts, are submitted to pressure with a moderate heat, and thus form a soft mass of intermixed fibres, named Cake Saffron; when dried separately, they form Flower Saffron. The former is what is usually kept. It is in tough cakes, somewhat moist, of a deep reddish yellow colour; its flavour is aromatic and diffusive, its taste warm and bitterish. The active matter is dissolved by alcohol, water, proof-spirit, and vinegar, and appears, therefore, to afford an example of the principle named Extract: the residuum, which is not more than 6 parts out of 16, is inert ligneous fibre. By distillation with water, a small quantity of essential oil is obtained. The extract has been called Polychroite; it is of a deep yellow colour, deliquescent, very soluble in water and alcohol, but insoluble in sulphuric ether. Sulphuric acid added to it causes it to assume a deep blue colour, and nitric acid gives it a green hue. Nitrate of mercury precipitates a red powder from the solution, and lime water gives a yellow precipitate.

* *Incompatible Substances.* The salts of iron. Paris. *Ed*

Saffron was formerly regarded as a very active medicine, possessed of high stimulant and antispasmodic power, and requiring, it was imagined, to be given with much caution. Experience has proved it to be nearly inert, and it is now banished from medical practice. It sometimes enters into compositions on account of its colour, and is used as a popular remedy in the exanthemata, particularly in small-pox.

Offic. Prep.—Tinct. Croci. *Ed. Dub.*—Syr. Croci. *Lond.*

MELALEUCA CAJUPUTI. *Polyadelph. Polyand. Hysperidæ. Oleum Volatile. Ol. Cajeputæ. Cajuput Oil. India.*

THE essential oil, known by the name of Cajuput Oil, was supposed to be obtained from the Melaleuca Leucadendron; but from later investigation, it appears to be procured from another species, to which the name of Melaleuca Cajuputi has been given. It is a native of Borneo and Amboyna. The oil is obtained by distillation from the leaves and fruit: it has a green or yellowish colour, a strong fragrant odour, somewhat similar to that of camphor, and an extremely pungent taste. It is highly volatile and inflammable.

This oil has been used as a diffusible stimulant, and antispasmodic, in tympanitis, flatulent cholic, hysteria, palsy, chronic rheumatism, and various other diseases of debility. Its dose is 3 or 4 drops. It is also applied externally to remove rheumatic and gouty pains, and sometimes gives sudden temporary relief; it often succeeds in relieving the pain of toothach, when applied to the affected tooth.

Several substances are employed as antispasmodics, and which I have therefore placed in the table, which more strictly belong, however, to some of the other classes. Under these, therefore, their history is given, including the notice of those few applications of them as remedies, connected with their antispasmodic power.

[Although not mentioned by Dr. Murray, *Emetics* may be considered among the most powerful antispasmodics at present in our possession. In many cases of spasmodic disease they possess an evident and decided advantage over most of the remedies ordinarily resorted to, in the facility with which they may be administered and the promptness with which they operate. In hysteria, epilepsy, and convulsions more especially, their efficacy has been confirmed by repeated trials, and there is just reason for believing that their use might be advantageously extended to a still larger number of diseases of a similar character. For some interesting views on this subject, I refer to a paper of Dr. Joseph M. Smith of this city, published in the transactions of the Physico-Medical Society of New-York.—*Ed.*]

CHAP. V.

OF TONICS.

BY TONICS are understood those substances, the primary operation of which is to give strength to the system. It has been conceived, that muscular vigour depends on a certain degree of tension, or tone, as it is nam-

ed, of the muscular fibre; and those substances which renew that vigour when impaired, have been considered as restoring this due degree of tension, and have thus received the appellation of Tonics. They are not, however, to be considered as operating by any change they produce in the state of the solids, as this opinion implies. They act upon the living principle, and, so far as their action is understood, are stimulants of considerable power, permanent in their operation.

The distinction has been already pointed out between stimulants, which is founded not so much on a difference in their power, as in the quickness with which their full effect is produced, and in the transient nature of that effect. If a medicine suddenly raises a high state of excitement, this is usually as quickly followed by proportional languor or debility, and the changes from both modes of action, in the state of the functions of the body, are well marked. But if the stimulant operation be more slowly exerted, any change is much less conspicuous, and the succeeding collapse takes place to no considerable extent; when the administration of the remedy is continued, it is prevented by the renewed excitement, and when it is suspended, the effect is merely a gradual abatement of excitement, which is rendered less evident from being counteracted by the action of the stimulants habitually applied. On these principles the action of tonics is explained. It is only by their stimulant operation that they can obviate debility; as their effect is gradual, their action is not followed by that exhaustion and diminished susceptibility which invariably follows from excitement suddenly raised; and the state of increased action which they excite and sustain is favourable to the acquisition of power. If their administration, however, be carried to excess, or be continued too long, it may at length diminish the powers of the system; and if employed in a state of health, or high vigour, their effects may be injurious.

Tonics act primarily on the stomach, the action they excite in that organ being conveyed generally by nervous communication to the rest of the system. This is evident from their effects often taking place in a short time; and there are experiments which prove, that when some tonics, as Peruvian bark, have been taken for a considerable length of time, no portion of them can be discovered by any chemical test in the blood. There are some of them, however, especially the metallic tonics, which seem to be received into the circulation.

The stimulating effect of tonics is principally to be observed from their continued administration; they increase gradually the force of the circulation, promote the action of the digestive organs, augment the secretions, or moderate them when they have been morbidly increased, and give vigour to the muscular system. From the action of some of the more powerful remedies of this class, these effects are apparent, even in a short time. The diseases in which they are employed must be obviously those of diminished power.

Tonics may be subdivided into those derived from the mineral, and those from the vegetable kingdoms: the former division comprehends several of the metals, and one or two of the earths. Under the vegetable tonics are comprised a number of substances possessing bitterness, and an aromatic pungency. These two qualities are generally blended in the most powerful tonics belonging to the vegetable kingdom; and there is a transition from these to the more pure bitters and aromatics. The stimulating action of the latter is rather too local and transient to give rise to much permanent tonic effect: yet they can scarcely by placed under any other

class, and I have therefore associated them with the substances with which they are thus connected. The purest Bitters are powerful Tonics, as is proved by their efficacy in curing intermittent fever, as well as by the advantage derived from them in a debilitated state of the digestive function. Aromatics may also be considered as tonic in their action on the stomach, if not on the general system, and are often employed to obviate debility in that organ, and to promote the powers of digestion.

TONICS.

FROM THE MINERAL KINGDOM.

Argentum.
Hydrargyrum.
Ferrum.
Zincum.
Cuprum.
Arsenicum.
Bismuthum.
Barytes.
Calx.
Acidum Nitricum.
Hyper-Oxymurias Potassæ.

FROM THE VEGETABLE KINGDOM.

Cinchona Officinalis.
Cinchona Caribæa.
Cinchona Floribunda.
Aristolochia Serpentaria.
Dorstenia Contrayerva.
Croton Eleutheria.
Cusparia Febrifuga.
Swietenia Febrifuga.
Swietenia Mahagoni.
Colomba.
Quassia Simarouba.
Quassia Excelsa.
Gentiana Lutea.
Anthemis Nobilis.
Citrus Aurantium.
Citrus Medica.
Acorus Calamus.
Laurus Cinnamomum.
Laurus Cassia.
Canella Alba.
Myristica Moschata.
Carophyllus Aromaticus.
Capsicum Annuum.
Piper Nigrum.
Piper Longum.
Myrtus Pimenta.
Amomum Zingiber.
Amomum Zedoaria.
Amomum Repens.
Carum Carui.
Coriandrum Sativum.
Pimpinella Anisum.
Mentha Piperita.

TONICS FROM THE MINERAL KINGDOM.

THESE are in general more local in their action than the vegetable tonics; they either operate more directly on the stomach without their action being so quickly extended to the whole system, or they act by being received into the blood. Hence they produce less immediate general excitement, and it is only from their continued administration, that their tonic effect is obtained. The analogies from which I have associated the substances under this division, are somewhat remote and imperfect; and to some of them, the appellation of tonics may be considered as applied by too free an extension of the term. But such imperfections in the classification of substances, from their action on the living system, are in the present state of medical science unavoidable to a certain extent. The substances with regard to which this objection may be urged in the present case, could scarcely be referred with propriety to any other class: affinities may be traced in their operation, sufficient to connect them by their medicinal effects; and, even considered individually, the claim of each may be established to a certain degree of tonic power.

ARGENTUM. SILVER.

THIS metal is distinguished by its pure white colour, its high degree of lustre, and it great ductility and malleability. It is not very susceptible of oxidation; it does not suffer that change from exposure, even in a state of fusion to atmospheric air. Those acids which yield oxygen readily oxidate and dissolve it, particularly nitric acid, which is hence employed as its usual solvent. The solution, when evaporated, affords the nitrate of silver in a crystalline form. This fused, forms the nitrate of silver of the Pharmacopœias.

It appears that nitrate of silver was sometimes employed by the older physicians, but the harshness and violence of its operation led to its disuse. More lately, it has been introduced as a remedy in epilepsy,—a disease which, when not depending on organic derangement, is frequently connected with morbid susceptibility, and which tonics sometimes remove. The advantage derived from the administration of nitrate of silver has been established on the testimony of Dr. Sims, Dr. Cappe, Dr. Bostock, and others. The dose is a quarter of a grain of the crystallized nitrate, which may be given three or four times a-day. It must always be given in a state of solution, as otherwise it might act with violence on the stomach; and distilled water must be employed to dissolve it, as spring water, from the saline matter it contains, decomposes it; to avoid, however, its nauseous taste, the solution may be made into pills with crumbs of bread. It sometimes acts as a cathartic, and if it occasion much purging with griping, or if it excite nausea, the dose must be diminished. In one case of Angina Pectoris, the symptoms were removed by a similar administration of nitrate of silver. Fused nitrate of silver, lunar caustic as it is named, is used as an escharotic.*

HYDRARGYRUM. HYDRARGYRUS. ARGENTUM VIVUM. MERCURIUS. Mercury or Quicksilver.

IT has not been usual, in arrangements of the articles of the Materia Medica from their medicinal power, to place mercury under the class of tonics, but rather under that of sialogogues. Its power, however, of exciting the salivary discharge is merely a secondary effect, not constant or uniform, and which is not essential to its efficacy in any disease. On the contrary, its tonic power is its primary operation; it is the most general stimulant belonging to the Materia Medica, pervading every part of the system; acting, as Dr. Cullen has remarked, as a stimulus to every sensible and moving fibre of the body, and producing the most permanent effects. Hence it is the most general evacuant we possess; and from its stimulant operation, exerted directly or indirectly, is derived its utility in many diseases.

This metal is peculiarly distinguished by its fluidity at all natural temperatures, with the exception of the intense cold that sometimes prevails in very northern regions. Its congealing point is —40° of Fahrenheit. In its liquid state, it has the perfect opacity and lustre characteristic of metals, and likewise the property of great density, its specific gravity being to that of water as 13.5 to 1 nearly: it boils at a temperature a little above 600°, and when boiling, suffers oxidation from the action of the atmospheric air. It is oxidated even at natural temperatures, when subjected to agitation;

* *Incompatible Substances.* Fixed alkalies and alkaline earths, the muriatic, sulphuric and tartaric acids, and all the salts which contain them. Soaps, arsenic, hydrosulphurets, astringent vegetable infusions, and undistilled waters. Paris. *Ed.*

or still more easily, when triturated with any viscid matter, which is interposed between its globules, so as to extend their surface.

Quicksilver occurs in nature combined with sulphur, and is obtained from this ore submitted to heat mixed with iron or lime, either of which combines with the sulphur, and the mercury is separated by distillation. The quicksilver of commerce is sometimes impure, or adulterated by the intermixture of other metals, particularly lead and bismuth. This may be suspected when the metal loses its lustre speedily, and is covered by a grey film, or from its diminished mobility, in consequence of which its globules do not preserve exactly the spherical form, nor unite easily with each other; and it may be discovered, with certainty, by exposing it to a heat sufficient to volatilize the quicksilver, when any other metal present will remain. It is best purified by distillation from iron filings in an iron retort.

Mercury is not, in its metallic state, applied to any medicinal use; but under various forms of preparation, in which it is either simply oxidated, or its oxides are combined with acids, it is extensively employed, and affords a series of active remedies.

When rendered active on the system by any of the modes of preparation to which it is subjected, it operates as a powerful and general stimulant. When given in moderate quantity, it communicates general vigour; it increases the force of the circulation, when this has been languid; by the increased vascular action which it excites, it gives to the blood the disposition to assume the buffy coat; and by its stimulant operation on secreting organs, it promotes the secretions, and hence acts as a very general evacuant. It peculiarly stimulates the salivary glands, and under all its forms of preparation speedily excites the salivary discharge, an effect scarcely produced by any other substance not locally applied, and probably owing, as will be explained under its history as a sialogogue, to its affinity to the saline matter existing in that secretion. It increases also the cuticular discharge, and it appears to promote the secretion of bile, and probably of the other intestinal fluids. Its stimulant operation on the absorbent system is not less evident; hence the emaciation which is the consequence of its continued action. From these diversified effects which Mercury produces, it is capable of being applied to the treatment of numerous states of disease.

In the febrile affections of warm climates, yellow fever and bilious remitting fever, it is a remedy of the highest value. It is probably useful principally as an evacuant, these forms of fever being peculiarly connected with a disordered state of the intestinal canal and abdominal secreting organs; and mercury always promoting the evacuation of the intestinal fluids; it is accordingly under the form of calomel, the mercurial which acts more powerfully on the liver and intestines, that it is chiefly employed. Some benefit may also be derived from its general stimulant action, as it proves most successful when given to that extent as to effect the system. Advantage is derived from it, probably from a similar mode of operation, in dysentery, especially when it is given in combination with opium. In the fevers of cold climates it is less employed.

There are some forms of inflammatory action in which mercury is useful. In that chronic inflammation particularly which affects glandular organs, it is the principal remedy both in counteracting it, and in removing that state of morbid structure which is often its consequence. Hence the peculiar advantage derived from mercurials in chronic hepatitis, and

induration of the liver, in glandular obstruction and schirrosity, and in indolent tumors. Calomel is the preparation which in these cases appears to be most effectual, though the introduction of mercury by friction is also employed, perhaps with equal success. Considerable advantage is also derived from it in rheumatism.

In various diseases dependent on spasmodic action, mercury affords the most powerful remedy. In tetanus particularly, if the mercurial action on the system can be fully established, the violent spasm is sometimes resolved, and calomel given to a large extent, aided by mercurial inunction, affords the remedy which has been most frequently attended with success. In the milder affection of trismus, it is employed with the same views. And cases of hydrophobia have occurred, in which the disease appears to have yielded to a similar mode of treatment. It is also a valuable remedy in croup. In all these cases calomel is the preparation usually employed.

The stimulant operation of mercury on the absorbent system, renders it useful in the different forms of dropsy. It is given to the extent of exciting salivation in hydrocephalus; in ascites it is more usually employed to promote the action of diuretics, and in that species of dropsy when it depends on induration of the liver; and also in dropsy of the ovarium, it proves still more useful by its deobstruent power. Its stimulant operation on the uterine system leads to its employment as an emmenagogue. And its determination to the intestines promotes the operation of purging.

Cutaneous diseases, lepra, tinea capitis, scabies, and others, are occasionally removed by the internal administration of mercury as an alterative; and these, as well as various forms of cutaneous eruption and ulceration, often yield to the external application of mercurial preparations.

The most important medicinal operation of mercury remains to be stated,—that displayed in removing the disease induced by the syphilitic poison. In this its power is nearly, if not altogether specific; no article of the Materia Medica could be substituted for it; and there may be affirmed of it, what cannot with equal justice be said of any remedy employed in the treatment of any other morbid affection, that, if duly administered, it will scarcely ever fail in effecting a cure. It is difficult to assign any satisfactory theory of its operation. Its efficacy has been ascribed to its general evacuant power, in consequence of which the syphilitic virus is discharged from the body. But the speedy disappearance of the local symptoms of syphilis under its use, and even from its local application, affords a proof that it operates on some other principle; no similar advantage is derived from other evacuants; and its efficacy is not proportional to the evacuation it excites, but is frequently displayed where this is insensible. The opinion has been advanced, that it acts as an antidote to the venereal virus, neutralizing it somewhat in the manner in which one chemical agent subdues the properties of another,—an opinion vague and hypothetical, and rendered improbable from the consideration of the small quantity of some of the more active preparations of mercury, from which a cure may be obtained, compared with the large quantity of others less active that requires to be administered. The explanation advanced by Mr. Hunter, that the efficacy of mercury in the treatment of syphilis depends on its general and permanent stimulant operation on the system, by which it induces and keeps up an action incompatible with that morbid action which constitutes the disease, until the virus is destroyed by the chemical changes going on in the system, or until it is eliminated from the body by the usual excre-

tions, is on the whole most probable; it rests on a principle undoubted, that there are states of morbid action incompatible, so that one suspends the action of the other; mercury does exert a very general action, inducing and keeping up what may be regarded as a morbid state; and if this is incompatible with the action which constitutes syphilis, the continuance of it for some time will suspend the latter; and the venereal virus will, in common with any other matter contained in the circulating mass, be changed or discharged.

Of late, however, some opinions have been brought forward, which, without denying the efficacy of mercury in the treatment of syphilis, place the subject in a different light. The disease in all its forms, it is affirmed, can be cured without the use of mercury, and by remedies of the simplest kind:—common dressings applied to sores, rest in the horizontal position, the common antiphlogistic regimen, and occasionally the use of the decoction of sarsaparilla. Under such treatment, the primary symptoms of syphilis, it is affirmed, disappear, though, it is admitted, more slowly than with the administration of mercury; and secondary symptoms do not supervene, it is asserted, more frequently than they do even after a common mercurial course, while the injurious effects of mercury on the constitution are avoided.

This subject remains under discussion, and the determination of it is attended with considerable difficulties, from the ambiguity of what constitutes real syphilis. It has been long known that there are morbid affections similar in their appearances and symptoms to those of lues venerea, and yet not arising from the syphilitic virus. And such affections, it appears from the observations which have been made since the attention of practitioners has been directed to the subject, by the introduction of nitric acid as a remedy, are more common and numerous than had been supposed. It is also known, that in many of these affections mercury is not only useless, but often injurious, especially when pushed to too great extent; while, on the contrary, they are removed by milder treatment. Independent of such affections, however, the disease of syphilis arising from the action of a specific poison is admitted to exist. It is also admitted, that the symptoms of this disease are removed, and the poison expelled, by the administration of mercury. When cases occur which yield to other remedies, there is always the doubt remaining that these may not be truly syphilitic; and it will require an experience more ample and more varied than has yet been afforded, before the question can be finally determined.

The mode of administering mercury, for the cure of the venereal disease, under all its forms, is now ascertained with sufficient precision. There is no advantage in giving it so as to induce profuse salivation; this is even to be avoided as hurtful; but it is proper that salivation should be excited to a certain extent; not probably as essential to its efficacy, but as a proof of its action on the system being obtained. This is kept up for a certain time, longer or shorter, according to the state of the symptoms, and the previous continuance of the disease. Exposure to cold is avoided, as being liable to cause the more partial operation of mercury on the salivary glands; and the state of irritation is diminished, or determination to the intestines producing purging is obviated, by the exhibition of an opiate. When profuse salivation occurs, the remedies employed to check it are cathartics in moderate doses, small doses of opium, the application of a blister to the throat, and the administration of sulphu-

ret of potash; the last being employed from the doubtful hypothesis, that its chemical agency may neutralize the mercury. Free exposure to a cool dry air is, according to the observations of Mr. Pearson, more effectual than any other method. When the morbid irritation, from the action of mercury, rises too high, producing a state of exhaustion, which sometimes proceeds rapidly to an alarming extent, the administration of the remedy must be immediately suspended; and in this case also, exposure to a cool atmosphere is advantageous.

The preparations of mercury, medicinally employed, are those in which it is oxidated, in which the oxidated metal is combined with an acid, or in which either the metal or the oxides of it are combined with sulphur. The particular processes for obtaining them are inserted and explained in the pharmaceutical part of the work. Here it is sufficient to notice briefly their distinctions and applications.

The Grey Oxide, formed by the trituration of mercury, is the basis of a number of preparations. In these, the metal has been supposed indeed to be merely mechanically divided; but in its metallic state, mercury does not appear to exert any action on the living system, and the activity of it in these preparations, is a proof that it is oxidated. This is established more directly; quicksilver, by agitation, is converted into a black powder, and this, like other oxides, is soluble in muriatic acid, which metallic mercury is not.

This oxidation is much promoted by the quicksilver being triturated with any viscous substance which facilitates the division of its globules. By trituration with mucilage of gum arabic, a preparation is obtained, named Plenk's Mercurial Solution, the operation of which is extremely mild. Rubbed with chalk, it forms the Hydrargus cum Creta of the London and Dublin Pharmacopœias, and with Magnesia the Hydrargyrus cum Magnesia of the Dublin Pharmacopœia, preparations having nothing to recommend them. The Mercurial Pill, prepared by triturating quicksilver with conserve of rose, and adding a sufficient quantity of starch to form a pill mass, is, of all the preparations adapted to affect the general system, the one most commonly employed, and is perhaps equal to any other, having the advantage of not being liable to produce much irritation, while we can depend on the certainty and permanence of its action. In a dose of eight grains, morning and evening, it soon affects the general system; in a larger dose, it is liable to occasion purging. Quicksilver, triturated with lard, soon loses its metallic form; and the ointment, after it has been kept for some time, contains little of it in the metallic state, the unctuous matter probably promoting its oxidation. The oxide is diffused through the lard, and, it has been conjectured, is in part too combined with sebacic acid, formed from the oxygenation of the fat. Rubbed on the skin, in the quantity of one drachm of the strongest ointment, (that composed of equal parts of quicksilver and lard,) it is forced through the cuticle, and is taken up by the absorbents; the system is thus affected, without the unpleasant consequences of nausea and purging, sometimes occasioned by the internal administration of even the mildest mercurial preparation; this method is employed, therefore, where, from the state of the system, these affections are liable to be produced. Where it is necessary too, to give the remedy in a large dose, or to bring the system speedily under its action, mercurial friction is employed, along with the administration of some of the mercuri-

al preparations by the mouth. And lastly, it has been supposed, that in certain local affections, particularly bubo, some advantage is derived from the mercury being conveyed through the affected gland.

The Mercurial Plaster is the metal triturated with melted resin and oil, and mixed with litharge plaster: it is sometimes applied to indolent glandular tumours as a discutient. Its power is supposed to be increased by the addition of gum-ammoniac, and this compound plaster has a place in the London and Dublin Pharmacopœias.

Mercury oxidated by exposure to atmospheric air, at a high temperature, gives an oxide in scales of a red colour, containing about 7 of oxygen in 100 parts. This, the red oxide (Oxidum Hydrargyri Rubrum of the London Pharmacopœia), affords a preparation which has been supposed to be the most uniform in its strength, and most certain in its operation, of all the mercurials. Its dose is one grain night and morning. It is more active than the grey oxide, but is more liable to produce irritation.

Various preparations are obtained from the metal oxidated by the acids. The nitrate of mercury decomposed by heat, furnishes what is named Oxidum Hydrargyri Rubrum per Acidum Nitricum by the Edinburgh College, Hydrargyri Nitrico Oxydum by the London, and Oxydum Hydrargyri Nitricum by the Dublin. It is probably not an oxide, but a sub-nitrate, and from the acid combined with it is derived its escharotic power, on which any medicinal application of it is founded; it is applied externally to change the diseased surface of ulcers, or to other purposes for which escharotics are used. This sub-nitrate, and also the nitrous solution of mercury, form, with lard, ointments which, from their stimulating power, are applied with the greatest advantage in chronic ophthalmia and psor-ophthalmia.

When the nitrate of mercury, containing the mercury in a low state of oxidation, is decomposed by ammonia, a precipitate is thrown down of a grey colour, which appears to be nearly a pure oxide. According to the Dublin and Edinburgh Pharmacopœias, it is prepared by triturating the sub-muriate of quicksilver with lime-water. It is the Oxydum Hydrargyri Cinereum of the Pharmacopœias; is mild in its operation, and is frequently employed, its dose being one or two grains. It is also sometimes used under the form of ointment, as a mode of applying mercurial friction.

Mercury, oxidated by sulphuric acid, forms the Sulphate of mercury, which, decomposed by the affusion of boiling water, affords a yellow powder, the Sub-sulphate, formerly named Turbith Mineral. This acts with too much violence to be used as a mercurial. In a dose of 3 or 4 grains, it operates as a powerful emetic, and it is sometimes used as an errhine.

The preparations in which the mercury is saturated with an acid, are very active. The nitrous solution of it is highly caustic. Mixed with lard, it forms an ointment, Unguentum Nitratis Hydrargyri, used with much advantage in cutaneous diseases.

Mercury, oxidated and combined with muriatic acid, forms two active preparations, differing in the degree of oxidation, and in the proportion of acid with which the oxide is combined. The one has been long known by the name of Corrosive Sublimate of Mercury, the other by that of Mild Sublimate or Calomel. The one is now named Corrosive Muriate of Quicksilver by the Edinburgh College, and Oxymuriate of Quicksilver by the London College; the other by the former College Mild Sub-muriate of Mercury, by the latter Sub-muriate of Mercury.

The first of these compounds, Corrosive Muriate of Mercury, is com-

posed of the metal highly oxidated, and this oxide is combined with a large proportion of muriatic acid. The proportions, according to Chenevix's analysis, are 69.6 mercury, 12.3 oxygen, and 18 of acid; those assigned from the later analysis by Zaboada, are 71.5 of mercury, 8.5 of oxygen, and 19.5 of acid. According to the hypothesis of Gay Lussac and Thenard, it is a compound of potassium and chlorine. It is obtained by sublimation in the form of a solid white mass, or, if more slowly sublimed, in crystalline needles. It is soluble in water and in alcohol, has a taste styptic and metallic, and exerts a degree of escharotic power. It is the most active of all the preparations of this metal: even in a small dose it occasions severe griping and purging; a larger quantity causes inflammation of the intestines, tenesmus, and discharge of blood, profuse salivation, and convulsions which terminate in death. As a poison, it affects both the heart and nervous system, the affection of the latter being marked by the convulsions and the state of insensibility which it induces; of the former by the rapid cessation of the circulation; it appears at the same time to act chemically on the stomach, the mucous membrane of that organ in an animal killed by it, being found on dissection soft and pulpy, so as to be easily detached. The remedies which have been employed to counteract it, are alkaline solutions, or lime-water, by which it may be decomposed, and mucilaginous diluents to facilitate vomiting.

Corrosive muriate of mercury is distinguished by some peculiarities of action from the other mercurials. From its great activity it sooner affects the system, and hence is calculated, in the treatment of syphilis, speedily to arrest the progress of the symptoms. Its operation too, when it is not given in too large a dose, is more general; it is less liable, therefore, to induce salivation, or any other local affection, and hence fewer precautions, with the exception of the due regulation of the dose, are required during its use. It succeeds best when given in small doses, such as the $\frac{1}{8}$ or $\frac{1}{9}$ of a grain twice a-day, and its operation is rendered more mild by the free use of diluents. It must always be given in solution, in order that the dose may be apportioned with sufficient accuracy. Its solution in diluted alchol is supposed to sit easier on the stomach than its watery solution, and under this form it was recommended by Van Swieten, who introduced its free use. Another form of prescribing it is, to increase its solubility by the addition of muriate of ammonia, so that a small quantity of water dissolves it, and to form this solution into pills by the addition of crumb of bread, each pill containing $\frac{1}{8}$ grain. Much caution is required in increasing the dose, and whenever it produces nausea or purging, it ought to be intermitted.

The advantages belonging to this preparation have led to its frequent use. It has disadvantages, however, which counterbalance them. Its effects are liable to be violent, and what forms the most important objection to it, its operation does not appear to be sufficiently permanent; hence, when the symptoms of syphilis have disappeared under its use, they are liable, it has been alleged, te return when it is supended, or the disease recurs in some of its secondary forms. From these circumstances it is now not much employed in the general treatment of syphilis, but is rather used from particular indications. Some of the empirical medicines which are boasted of as antisyphilitic remedies, and as containing no mercury, owe their efficacy to it; its activity rendering the dose so small that it is more easily disguised by substances with which it is mixed, and

its action being less liable than that of others, when the dose is small, to excite salivation. It is employed in other diseases in regular practice, particularly as an alterative in lepra and other obstinate cutaneous affections, and in rheumatism. A very dilute solution of it is used as a gargle in venereal sore throat, and as a lotion in some cutaneous affections. The system has sometimes been observed to be affected from its free external application, especially in a concentrated state, under the form of ointment or plaster; and some cases are related by Plenk, of death having been the consequence of such applications. When introduced into a wound, it occasions death, producing, at the same time, total disorganization of the part.*

Mild Muriate of Mercury, or Calomel, is obtained by triturating the corrosive muriate with nearly an equal part of the metal, and favouring their mutual action by the action of heat, by which also the product is sublimed. The additional metallic mercury which is thus brought into combination, shares the oxygen and the acid of the corrosive muriate, so that the whole of the metal is in a lower degree of oxidation, and this oxide is combined with less muriatic acid. The quantity of acid, however, is as much as the oxide requires to combine with it, and hence the product is not a sub-muriate, as the name given to it in the Pharmacopœias implies. The proportions of its principles, according to its analysis by Chenevix, are mercury 79, oxygen 9.5, and acid 11.5; according to its analysis by Zaboada, they are 85 of mercury, 4.4 of oxygen, and 10.6 of acid. According to the hypothesis of Gay Lussac and Thenard, it is a compound of potassium and chlorine, containing half the quantity of chlorine that the corrosive muriate does. It is obtained in the form of a dense crystalline cake, composed of short aggregated prisms; if its vapour be condensed on the surface of water, this aggregation is prevented, and it is obtained in powder, as it is also when prepared in the humid way, by decomposing a solution of nitrate of mercury at the minimum of oxidation, by muriatic acid or a solution of muriate of soda. It is perfectly insipid, and insoluble in water.

Mild muriate of mercury is one of the mildest of the mercurials, and one of the most certain in its operation on the general system. It is not so much employed as a remedy in syphilis, principally from its being liable to induce purging; but when this is obviated by the addition of small doses of opium, it is given in the dose of one or two grains morning and evening, and soon affects the general system. It is the mercurial, however, which is chiefly employed in the treatment of the other diseases in which mercury is prescribed. To the treatment of some of them it is peculiarly adapted by its action on the intestinal canal. and the secreting organs connected with it; hence its employment in febrile affections, in hepatitis and chronic induration of the liver, in schirrous affections of other visceral organs, in dysentery, and as a remedy in worms. The mildness of its operation rendering it safe to administer it in large doses, so as speedily to bring the system under the action of mercury, renders it equally proper for administration in tetanus, hydrophobia, croup, and other diseases in

* *Incompatible Substances.* Alkalies, alkaline earths, tartarized antimony, nitrate of silver, acetate of lead, sulphur, sulphuret of potash, and soaps; iron, lead, copper, bismuth and zinc in their metallic state; the volatile oils, and the following vegetable infusions, viz. infusions and decoctions of chamomile, horse radish root, columbo-root, catechu, cinchona, rhubarb, senna, simarouba, oak bark, tea, and almond emulsion. Paris. *Ed*

which this is required. The same mildness adapts it to continued use; hence the preference given to it in cutaneous affections, in glandular obstructions, in dropsy, and wherever mercury is employed as an alterative. It not only produces the general effects of a mercurial, but also, when given in sufficient doses, acts with certainty and safety as a cathartic. It is hence often employed to promote the operation of other cathartics, and it has the peculiar advantage, that it does so without adding to the irritation which they are liable to occasion. Hence this combination is peculiarly useful where it is difficult to cause purging, or where from the state of the stomach, the usual cathartics are liable to be rejected, especially when they are given in large doses. Its dose as a cathartic is from five to ten or even fifteen grains. When prescribed with other intentions, the dose is various; as an alterative, a grain is given night and morning, and this, after being continued some time, will affect the system. When it is necessary that this should be done more speedily, a larger dose is prescribed, and, if necessary, its purgative operation may be obviated by opium.*

Hydrargyrum Præcipitatum Album of the London Pharmacopœia, Sub-Murias Hydrargyri Ammoniatum of the Dublin College, is prepared by decomposing corrosive muriate of mercury by ammonia. A precipitate is thrown down, which consists of oxide of mercury combined with a portion of muriatic acid and a small quantity of ammonia, the proportions being 81 of oxide, 16 of acid, and 3 of ammonia. It is too acrid for internal use, but is employed externally as a mild escharotic, and as an application in various cutaneous affections. An ointment adapted to these purposes has a place in the London and Dublin Pharmacopœias.

With acetic acid mercury forms the Acetas Hydrargyri, which, as the basis of Keyser's pill, was at one time much celebrated for the mildness of its action: it is given in a dose of from 2 to 5 grains; its operation has been supposed, however, to be uncertain, and it has fallen into disuse. This, as well as other saline compounds of Mercury, are most easily obtained by adding to a solution of nitrate of mercury a solution of a compound salt, containing the acid with which the oxide of mercury is to be combined. Thus, to form the acetate, a solution of acetate of potash is added to the solution of the nitrate.

United with sulphur, mercury forms two preparations, the black sulphuret, and the red. In both of them the metal has been supposed to be oxidated. This has not been established, however, and it is probable that they are metallic sulphurets without oxygen. The black sulphuret, formerly named Ethiops Mineral, is prepared by triturating equal parts of mercury and sulphur together, so as to form a black powder. It is an inactive preparation, and has been used only as an anthelmintic, in a dose to an adult of one scruple or half a drachm. The red sulphuret, or Cinnabar, is the mercury united with about one-sixth of its weight of sulphur by sublimation. It is applied principally by fumigation, with a view of stopping the progress of venereal ulcers, being converted into vapour by being laid on a hot iron, and this vapour being directed on the part.

Ferrum. Iron.

This metal is the one which has been regarded as most salutary to the

* *Incompatible Substances.* Alkalies, lime-water, soaps, sulphurets of potash and antimony, iron, lead, and copper. Paris. *Ed.*

animal system ; and the remark is perhaps just, that it is the only metal having any sensible activity, which has no poisonous quality. It exists as a constituent principle of the blood, and has hence been supposed to serve some important purpose in the animal economy. When given medicinally, the effects obtained from it are those of a tonic ; it increases the vigour of the circulation, causes the blood, it has been affirmed, to assume a more florid hue, promotes digestion, excites the secretions, or restrains them when they have been morbidly increased, and by its astringency checks profuse evacuations, and counteracts the tendency to hæmorrhage. It is in diseases of debility that it is employed, and as its operation is only gradual, chiefly in chronic affections—dyspepsia, hypochondriasis, hysteria, amenorrhea, leucorrhea, passive menorrhagia, chronic catarrh, hectic, paralysis, scrofula, and rickets. It is less proper where there is any tendency to inflammatory action, or a plethoric state of the vessels ; and its administration ought to be suspended when it renders the pulse quick in such cases, or when it occasions a sense of fulness, headach, or costiveness. The remark has been made by Cullen, that "the good effects of "the preparations of iron have been often missed, by their being given in "too small doses." The opposite observation is probably more just, that they are lost from too large doses being employed ; and in practice this is perhaps the more common error. Large doses of the less active preparations, as the rust of iron, seem to lead the stomach without any equivalent advantage ; the more active saline preparations, on the other hand, cause disorder of its functions, impaired digestion, pain, and irritation ; it is this indeed which gives rise to the principal difficulty in the administration of iron as a tonic. And this very irritation which the active chalybeates excite, counteracts their salutary operation, and probably prevents their conveyance into the circulation, on which their efficacy may depend. These inconveniences are best obviated by giving the active preparations of iron in small doses, regularly taken, continued for some time, amd rendered milder by dilution. Hence, probably, the greater benefit derived from the chalybeate mineral waters than from iron in any other form. Besides dilution, the addition of an aromatic is often useful, and in all cases the precaution ought to be attended to, of diminishing the dose, or intermitting the remedy when it produces irritation, nausea, or impaired digestion.

Numerous preparations of this metal are medicinally employed.

The filings of iron, (Limatura Ferri), which, for medicinal use, are purified by the magnet, are given in a dose from a scruple to a drachm or two ; their activity is probably dependent on the oxidation they suffer in the stomach, from the action of the gastric fluids. They are administered mixed with a little sugar and aromatic.

The Sub-carbonate, or Rust of Iron, (Sub-Carbonas Ferri Præparatus, Ph. Ed. Rubigo Ferri, Ph. Dub.), is the metal oxidated by the action of atmospheric air and water, and combined with carbonic acid : it is more active than the pure metal, and less irritating than the saline preparations. It is given in a dose from 5 to 20 grains. Besides its use as a general tonic in the cases in which chalybeates are usually employed, it has been used as a remedy in cancerous ulceration, both internally administered in its usual dose, and externally applied sprinkled on the sore. Cases have been given in which this practice has proved successful, while, from the experience of others, it has appeared to operate merely as a palliative, or at farthest, to be of permanent advantage only in some forms of ill-con-

ditioned ulcers, not truly of a cancerous nature. Another form of it, supposed to be more pure, is what is named Carbonas Ferri Præcipitatus, prepared by adding a solution of carbonate of soda to a solution of sulphate of iron. This was first used under the form of an extemporaneous preparation combined with Myrrh, *Griffith's Antihectic Mixture* which had obtained celebrity as a remedy in chronic catarrh, connected with increased mucous secretion, in obstinate sympathetic cough, in phthisis and hectic. It is still used in these cases, and as a mild tonic in other affections connected with debility or morbid irritability. In the Edinburgh Pharmacopœia the precipitate of carbonate of iron is ordered to be washed and dried In this case it absorbs oxygen, and in consequence of this differs little from the rust of iron.*

Muriate of Iron and Ammonia, of the Edinburgh Pharmacopœia, what is named by the London College Ferrum Ammoniatum, is obtained, by sublimation, from a mixture of muriate of ammonia and red oxide or carbonate of iron. It is an active preparation, but liable to be variable in composition. It is given in a dose from 5 to 10 grains. Dissolved in diluted alcohol, it forms an officinal tincture, the dose of which is 30 drops.

The Muriate of Iron, employed under the form of tincture, (Tinctura Muriatis Ferri), is prepared by dissolving black oxide of iron in muriatic acid, and diluting the solution with alcohol. It is a very active preparation; sometimes too much so to admit of being used in an irritable state of the stomach. Its dose is 10 or 15 drops diluted with water, or taken in wine, in which it is more grateful. If it occasions nausea or pain, the dose must be diminished. It is the preparation usually employed where the full operation of iron is attempted to be obtained. Besides its employment in the diseases in which chalybeates are usually prescribed. Mr. Cline has mentioned a peculiar application of it in which it had proved of singular efficacy, that of suppression of urine from spasm of the urethra, 10 drops being given every ten minutes; after the sixth dose the suppression in different cases was relieved.

Sulphate of iron is formed in the large way, by the oxygenation of the native sulphuret by exposure to air and humidity; or it is obtained more pure by dissolving iron in diluted sulphuric acid, and evaporating the solution. It crystallizes in rhomboidal prisms of a green colour. It is one of the most active preparations of the metal, and is not unfrequently prescribed in amenorrhœa. Its dose is from one to five grains.† The red sulphate appears to be possessed of still higher tonic power, and has been employed which much advantage as a remedy in the various forms of dyspepsia and hypochondriasis. It is prepared by adding to nitrous acid the green sulphate in powder, as long as any effervescence takes place, apply-

* Much interesting evidence has lately been communicated to the public concerning the efficacy of carbonate of iron in *Tic Douloureux*. To Dr. Hutchinson, a respectable English surgeon, is due the credit of originally suggesting the practice, as also of confirming it afterwards by numerous examples of its success. In a few cases, the practice has been tested in this country, and with the happiest results. Dr. Eights, of Albany, has related two cases of this disease, which yielded very promptly under the use of the iron after every other remedy had been perseveringly tried, but without effect. See New-York Med. and Phys. Journal, vol. 1. p. 323. According to Dr. Hutchinson, it is to be administered in doses of from half a drachm to a drachm, two or three times a-day. *Ed.*

† *Incompatible Substances.* Every salt whose base forms an insoluble compound with sulphuric acid; the earths, the alkalies, and their carbonates; borate of soda, nitrate of potash, muriate of ammonia, tartrate of potash and soda, acetate of ammonia, nitrate of silver, subacetate and acetate of lead, and soaps. Paris. *Ed.*

ing a gentle heat to favour their mutual action. The residual liquid is a saturated solution of the red sulphate, and may be given in a dose of four or five drops twice or thrice a-day.

The Tartrate of Potash and Iron is prepared by rubbing one part of iron-filings, and two parts of super-tartrate of Potash, with one of water, exposing the mixture to the action of the air, drying the mass, and again subjecting it to the action of water, to render the oxidation and combination of the iron more complete. The preparation is a mild one, and can be given to the extent of 10 or 15 grains as a dose. A similar preparation, in which the iron is more highly oxidated, and its combination with the tartaric acid more perfect, is obtained by a process given by the Dublin College, in which carbonate of iron and super-tartrate of potash are boiled with water, the liquor filtered, and evaporated until on cooling it form a saline mass. This, in a dose of three or four grains twice a-day, acts not only as a tonic, but also as a diuretic, and from the combination of these powers, has been employed as a remedy in dropsy. From the mildness of its operation, too, it is well adapted for exhibition in scrofula.

The Wine of Iron, which has a place in the London and Dublin Pharmacopœias, prepared by digesting iron-filings in white wine, is another form under which the tartrate is used; the metal being dissolved by the tartaric acid of the wine. Its dose is one or two drachms.

Acetate of iron has been introduced by the Dublin College, being prepared, according to one process they have given, by digesting carbonate of iron in acetic acid: according to another, by rubbing together acetate of potash and sulphate of iron until they become soft: drying this with a moderate heat, and digesting it with alcohol. Of the tincture thus formed, 20 or 30 drops are a dose.

The London College have given a place to a preparation of iron, (Liquor Ferri Alkalini), of rather a singular nature. Iron is dissolved in nitric acid largely diluted: and to this solution a solution of sub-carbonate of potash is added, as long as effervescence is excited: the liquor, after standing six hours, is poured off. It seems to be a ternary combination of oxide of iron, potash, and carbonic acid; any nitric acid remaining undecomposed in the oxidation of the iron being probably withdrawn combined with a portion of potash, as the liquor, on standing, deposites nitre. This preparation has been long known by the name of Stahl's Martial Alakaline Tincture. It had almost entirely fallen into disuse, so that few recent observations have been made with regard to its powers. The following account of it is from the experience of a very able physician. "It in general sits easy on the most delicate stomach, and instead of impairing, rather increases the appetite and assists digestion. It usually proves laxative and diuretic. Hence, it is given with great advantage in dropsical complaints, and particularly in those cases of dropsy where it is the practice to conjoin tonics with the usual evacuants, or to prescribe them when the dropsical fluid has been removed by diuretics or by an operation. In scrofulous affections of the glands, and in scrofulous ulceration, it has proved a valuable remedy, as it has also in leucorrhœa and in gleet. Much advantage is derived from it too in pulmonary affections, after the inflammatory stage has been removed, where a tendency to relapse exists, or where any spasmodic symptoms have supervened. Its medium dose is 10 drops three or four times a-day in a glassful of water, and this may be increased gradually to 20 or 30 drops. It has been increased to 60 or 80 drops a dose, but this is not adviseable, as it produces uneasiness

at the stomach, and acts very powerfully on the bowels. Its action on the bowels is the best criterion to determine to what extent the dose may be increased, always taking into view, that less advantage is to be derived from large doses of iron, than from small doses long and regularly taken." Though these powers render this preparation a valuable one, it has the disadvantage, as is to be stated under its Pharmaceutical history, of being liable to be variable in strength. The dose, however, being regulated in some measure by its operation, may with care be accommodated to this: and as it appears to sit easier on the stomach, and to prove less irritating than any of the other active chalybeates, an advantage probably derived from its alkaline impregnation, it undoubtedly deserves a farther trial.

The Mineral Chalybeate Waters afford another form under which iron may be administered. The iron is generally dissolved in them by carbonic acid: and from the state of dilution, they are often used with more advantage than the more active preparations of the metal.*

Zincum.

This metal is of a white colour, with a shade of grey; it is brittle, except at a temperature between 200° and 300° of Fahrenheit, when it has considerable ductility and malleability; it is fusible at a heat approaching to that of ignition, and when raised to that temperature burns with a bright flame, forming a white oxide.

Zinc exerts no sensible action on the system in its metallic state: it is employed therefore under various forms of preparation, which are in general possessed of a degree of tonic and astringent power.

White oxide of zinc, obtained by the combustion of the metal, has been employed as a remedy in spasmodic affections, particularly chorea and epilepsy, in a dose of five grains, gradually increased. There are cases on record where a cure was obtained; but it is not very active or certain in its operation. An ointment composed of it is used as a healing cerate, and as an application in ophthalmia.

There is a substance named Impure Oxide of Zinc by the Edinburgh

* Very recently, the *Prussiate of Iron* or Prussian Blue has been introduced into practice by Dr. Zollickoffer of Maryland. So high does he estimate this preparation of iron in the treatment of remitting and intermitting fevers, that he gives to it a decided preference over arsenic, Peruvian bark, as well as over all the other forms of iron. Over cinchona he asserts it to possess the following advantages: viz. "1. It is void of taste, and may therefore be much more readily exhibited than the *cinch. offic.* which, to some, is extremely unpleasant. 2. It may be given in every stage of the disease; while the administration of bark is confined to the *apyrexiæ*. 3. The dose is much smaller, being from 4 to 6 grains twice or thrice in twenty-four hours; or at morning, noon, and night; while bark, to be effectual, must be given in much larger doses. 4. It never disagrees with the stomach, or creates nausea, even in the most irritable state of this *viscus:* while bark is not unfrequently rejected. 5. In its effects as a remedy calculated to prevent the recurrence of future *paroxysms*, it is more certain, prompt, and effectual than the justly celebrated *cort. peruvian.* 6. and lastly, A patient treated with this article will recover from the influence of intermitting and remitting fevers, in the generality of cases, in much less time than is usual in those cases in which bark is employed. In making use of the Prussiate of Iron as a remedy in disease, care must be taken to select that which is of a very dark blue, approaching to a black, having a shining coppery fracture, and adhering firmly to the tongue."—In this city, numerous trials have been made of this article, and generally, in confirmation of the good opinion expressed concerning it by Dr. Zollickoffer. It has also been used with success in epilepsy, and in an obstinate case of periodical hemicrania, which had resisted all the ordinary remedies. *Ed.*

College, long known by the name of Tutia, the nature and origin of which are not well ascertained. It has been supposed to be artificial, and to be prepared from oxide of zinc obtained in the roasting of zinc ores, and afterwards mixed with clay. It is of a grey colour, and earthy texture, and when levigated, is used sometimes as the basis of a cerate employed as a dressing to wounds, or applied to the eye in some forms of ophthalmia.

What has been named Calamine Stone, (Lapis Calaminaris), is regarded as a carbonate of zinc; and it generally is so, though there are varieties of it composed of oxide of zinc and siliceous earth. It is employed only externally, the levigated powder is dusted on the skin in slight cases of excoriation and superficial inflammation, and it forms the basis of the common healing cerate.

Sulphate of Zinc,* formed by exposure of the native sulphuret to air and humidity, is obtained by evaporation of its solution in a solid mass, forming the white vitriol of commerce; or it is procured more pure, and in a crystalline form, by evaporation of the solution of zinc in diluted sulphuric acid. It has been employed in the same cases as the oxide, and Dr. Cullen has observed that it is possessed of the same powers; it has likewise been given, in the dose of a few grains, as a tonic in intermittent fever, as a tonic and astringent in chronic dysentery, and in small doses combined with bitters, as a tonic in dyspepsia. Its administration, in all these cases, requires to be conducted so as to obviate the nausea which it is liable to occasion. In a large dose it operates as an emetic, and is sometimes employed as such in a dose from 10 to 20 grains, particularly where the stomach is not easily roused to action, as where a narcotic poison has been swallowed. Its solution is a common astringent injection in gonorrhœa in the strength of a grain and a half to an ounce of water; and nearly of the same strength it is often employed as a collyrium in ophthalmia. Acetate of Zinc, under the form of solution, has a place in the Edinburgh Pharmacopœia, being obtained by mixing solutions of acetate of lead and sulphate of zinc; sulphate of lead is precipitated, and acetate of zinc remains dissolved. It is used as a collyrium in ophthalmia, and an astringent injection in gonorrhœa, and is considered as less irritating than the solution of the sulphate.

Cuprum. Copper.

This metal is not, like the greater number of the metals, insipid and inodorous; it has an unpleasant styptic taste, and when rubbed, a perceptible smell. It is extremely noxious to life. Still, when properly administered, it proves a remedy of value, and, like zinc, has some claim to be ranked as a tonic, from its successful operation in epilepsy, chorea, and other spasmodic affections dependent on or connected with debility. It is also employed under various forms of preparation as an astringent, emetic, and escharotic.

Sulphate of Copper,† Blue Vitriol as it was named, is its most important saline compound. It is obtained from the water which filtrates through

* *Incompatible Substances.* Alkalies, earths, hydro-sulphurets, astringent vegetable infusions, milk. Paris. *Ed.*

† *Incompatible Substances.* Alkalies, and their carbonates, sub-borate of soda, acetate of ammonia, tartrate of potash, muriate of lime, nitrate of silver, sub-acetate and acetate of lead, oxy-muriate of mercury, all astringent vegetable infusions and tinctures. Iron, immersed in the solution, precipitates copper in a metallic form; hence the exhibition of the filings of iron has been proposed as an antidote. Paris. *Ed.*

copper mines, in which it exists dissolved ; or it is prepared by calcining the native sulphuret of copper, and exposing it in a humid state to the air ; the metal is oxidated, the sulphur, also absorbing oxygen, is converted into sulphuric acid, and the sulphate of copper, thus formed, is procured by lixiviation and crystallization The crystals are short rhomboidal prisms, of a rich blue colour, transparent, but liable to a slight efflorescence. This salt is rather too active to admit of internal administration as a tonic ; even in a very small dose it excites nausea and vomiting ; and as a powerful emetic it is employed, where, from the state of the stomach, it is difficult to excite vomiting, as where a narcotic has been taken in too large a quantity ; the dose being from 2 to 5 grains, or even larger, according as it is more difficult to excite vomiting. Externally it is used as an astringent and escharotic,—applications of it to be afterwards noticed.

Sub-acetate of Copper, Verdigris as it is named, is prepared by covering copper plates with the husks of the grape, after the expression of the juice in the wine-press. A number of plates with the interposed husks being placed together, and being occasionally moistened, the vegetable matter passes into fermentation, and a portion of acetic acid is formed ; this acting on the copper forms a green oxide, with which a portion of the acid combines, so as to form a sub-acetate. The crust of this is scraped off, and beat into masses, which are dried. It is of a bright green colour, and from the excess of oxide it contains, is only partially soluble in water. By dissolving it in distilled vinegar, this oxide is saturated, and by evaporation of the solution, the acetate of copper is obtained in a crystallized mass of a very deep green colour. This is scarcely medicinally employed. The sub-acetate has been employed as a form of giving copper in epilepsy, and also as an emetic ; but it is chiefly as an escharotic that it is used in modern practice.

The preparation named Ammoniuret of Copper (Ammoniaretum Cupri, Cuprum Ammoniatum) is the one usually employed to obtain the action of copper on the system. It is prepared by triturating sulphate of copper and carbonate of ammonia together, and is either a ternary compound of oxide of copper, ammonia, and sulphuric acid, or a mixture of sulphate of ammonia, and the compound of ammonia with oxide of copper. It is given in epilepsy, in a dose of half a grain twice a-day, increasing it gradually as far as the stomach or system will bear it, and continuing it until it has received a fair trial. It has in some cases proved successful, though in a disease arising from such various causes, and so frequently depending on derangement of organic structure, any remedy must frequently fail. It has been given in a similar manner with advantage in chorea and dysphagia.

Arsenicum. Arsenic.

The term Arsenic used to be applied to the oxide of the peculiar metal, to which the name is now appropriated. It occurs sometimes native, or in the state of oxide, but more generally combined with sulphur, forming the ores named Orpiment and Realgar ; and frequently also associated with other metallic sulphurets. It is extracted from these by sublimation, in the state of an oxide, its oxidation being effected by the action of the atmospheric air during the volatilization : and from this oxide the arsenic is usually obtained by exposing it to heat mixed with a portion of black flux or charcoal ; the metal is sublimed. Metallic arsenic is of a dark grey colour, with considerable lustre, which is however very liable to tarnish ;

its texture is foliated, and it is extremely brittle ; its specific gravity is 8.3. It is volatile at a heat considerably inferior to that of ignition, and when in vapour has a peculiar smell, often compared to that of garlic. At the same temperature, it is oxidated rapidly by the action of the air, forming a white smoke which condenses. At a higher temperature it burns, and affords the same product. This product used to be regarded as an oxide. Being soluble however in water, capable of crystallizing, reddening the infusion of litmus, and combining with the alkalies, it has been regarded as an acid, and has been named Arsenious Acid. Though there is some foundation for this conclusion, this substance may perhaps still be ranked as an oxide ; for it does not neutralize the alkaline properties, nor act on them more forcibly than many other metallic oxides ; it even neutralizes the properties of acids. By a higher degree of oxygenation, it is converted into a substance of undoubted acid powers, the arsenic acid.

The oxide of arsenic, or white arsenic of commerce, is usually obtained by sublimation in the roasting of various metallic ores, particularly those of cobalt, in which it exists. The sublimate, at first impure, is again sublimed, and is thus obtained in the form of an opaque white dense cake, which is reduced to powder, for the uses to which it is applied. In the London Pharmacopœia, this is ordered to be prepared for medicinal use by another sublimation, probably without any necessity. It consists of 75.2 of arsenic, and 24.8 of oxygen, its taste is acrid and penetrating ; it is soluble in 80 parts of cold, and in 15 parts of boiling water ; the latter solution, on cooling, affording minute crystals : it reddens the colour of litmus.

This substance has been long known as the most virulent of the mineral poisons. In a very small quantity, it occasions vomiting, purging, tremors, and paralysis : in a quantity a little larger, it excites severe pain in the stomach, with a sense of heat extending from the œsophagus, extreme thirst, violent vomiting, with anxiety and depression. The pain extends over the abdomen, respiration becomes difficult, the pulse is small, quick, and irregular ; the vomiting is incessant, accompanied with tremors, convulsions, and fainting : there is a sense of coldness, sometimes with cold sweats ; paralysis frequently supervenes, and the patient dies exhausted. On dissection, the internal surface of the stomach and upper part of the intestines is found inflamed ; the inflammation is usually confined to the mucous membrane, which has often a florid red colour, is soft and pulpy, and easily detached ; the blood-vessels on its surface are frequently turgid, and sometimes there are small spots of extravasated blood ; signs of putrefaction, it has been said, appear sooner than in other cases of sudden death, but this is doubtful, as well as the appearance of livid spots on the skin, which has been said to occur ; the blood is usually fluid, and the body is frequently swelled.

All the effects of arsenic, it has been established, are produced by its incautious external application, and they appear with violence when the arsenic is applied to a wound. Some facts which had been partly known with regard to this have lately been confirmed by the experiments of Mr. Brodie, so as to lead to a more peculiar view of its mode of operation. When applied externally to a wound, it occasions death even more speedily than when it has been received into the stomach, and with similar symptoms ; vomiting and purging, in particular, are produced to as great an extent, and on dissection the stomach and intestines are found to be in-

flamed. This shews the determination of its action to these parts; and as the inflammation of the stomach is found even to precede any appearance of the inflammation of the wound, so that the former cannot be considered as connected by sympathetic action with the latter, it, as well as the general affliction of the system, probably arises from the arsenic being received into the circulation through the divided blood-vessels of the wound. Though the inflammation of the stomach, which follows from its internal administration, may arise from its direct application, it is possible that it may be produced in this indirect mode by its entering the circulating mass.

Though so violent in its operation, arsenic has been frequently employed in medical practice; and, when properly administered, we obtain from it, in certain diseases, all the advantage which is derived from the operation of the most safe and powerful tonic. This is well displayed in its efficacy in the treatment of intermittent fever, the disease in which it has been principally used.

It is employed medicinally under various forms. A preparation of it introduced by Fowler, and analogous to one which had been known under the name of Tasteless Ague Drop, has been adopted by the London and Edinburgh Colleges, named Solutio Arsenicalis.* It is prepared by dissolving sixty-four grains of the white oxide, and the same quantity of subcarbonate of potash, in sixteen ounces of water, adding half an ounce of compound spirit of lavender. This is given in a dose of 4 drops, three times a-day, which is gradually increased to double that quantity; its administration being occasionally intermitted, not too long persisted in, and immediately relinquished if it occasions nausea or purging, vertigo, headach, or cough, or indeed any particular indication of the system being much much under its influence. The arseniate of potash, prepared by exposing white oxide of arsenic, with an equal weight of nitre, to a heat gradually raised to redness, and crystallizing the residual mass, is another preparation which has been employed, and has been sanctioned by the Dublin College. It is used in the same manner, in the dose of the eighth part of a grain of the crystallized salt. Under the same forms arsenic has been given in remitting fever, in periodic headach, in that painful affection of the face named Tic Douloureux, as an antidote to the poison of venomous animals, in hydrophobia, lepra, and elephantiasis; and in some of of these diseases with very marked advantage, in cases where other remedies have failed. In some forms also of epileptic affections, it has been administered with success. Its administration always requires, however, to be conducted with much care. Even in the small doses in which it has been administered medicinally, it is liable to exert its deleterious agency. It often excites nausea, pain at stomach, and purging; sometimes pain in the forehead, with a sense of tension, a stiffness of the palpebræ, soreness of the mouth, and increase of the salivary discharge: and when its operation proceeds still farther, it excites severe symptomatic cough: these effects sometimes arise even from its external application. Whenever they appear, the dose ought to be diminished; and if they become urgent, the use of the remedy ought to be immediately suspended Orfila states from his own observations, that given even in very minute doses, and with all possible precaution, it not unfrequently excites a predisposition to organic diseases of the heart. In some of the affections where its full opera-

* *Incompatible Substances.* Lime water, nitrate of silver, the salts of copper, hydrosulphuret of potash, and the infusions and decoctions of bark. Paris. *Ed.*

tion must be immediately obtained, as where it is used as an antidote to the bite of serpents, it requires to be given in a larger dose,—that of a grain.

Externally, arsenic is used in scirrhus and cancer; applications of it to be noticed under the class of Escharotics.

The antidotes which have been employed to counteract the poisonous operation of arsenic are various. Vomiting, if not produced by its action, which it generally is, must be immediately excited, and as the stomach is highly irritable in such cases, the milder emetics, and especially oil, which is supposed to involve the particles of the poison, have been recommended. According to the experiments of Renault, oil appears rather to favour its action; probably, from its not mixing easily with the contents of the stomach, or the mucus on its surface, and therefore not aiding its rejection; tepid water, or mucilaginous liquors, ought to be preferred; these too are useful in facilitating vomiting. Reliance has been placed on solutions of the alkaline sulphurets, or of sulphuretted hydrogen. The latter appears, from Renault's experiments, to have some power, since, if previously combined with the arsenious acid, it rendered it nearly inert; but if merely introduced into the stomach with it, or after it had been swallowed, especially if the arsenic were not dissolved, it seemed to have little efficacy as an antidote, and indeed cannot be expected to have much effect. A solution of soap has been recommended as useful from its alkaline matter, and it has the advantage of being easily procured. As the effects from arsenic are those denoting inflammatory action in the system, and as even the inflammation of the stomach and intestines seems to be the consequence of this as much as of any local operation of the arsenic itself, blood-letting would appear to be indicated, and in a case of such urgency might be carried to a considerable extent with advantage. In a case related by Dr. Roget, (Medico-Chirurgical Transactions, Vol. II.), in which blood-letting was suggested by the evident inflammatory affection of the stomach, eighteen ounces of blood were drawn from the arm, the patient fainted, and remained half an hour in a state of insensibility. The violent affection of the stomach, however, was relieved, and after a succession of various symptoms indicating affection of the nervous as well as of the vascular system, the patient recovered, though with difficulty, and was restored to health.

The medical practitioner has sometimes to determine in cases of judicial investigation. whether a person has been poisoned by arsenic or not. This can scarcely be inferred with certainty from the symptoms, nor even from the state of the stomach ascertained by dissection; for although inflammation is usually present, and has the characters stated above, it is not invariably so; or when it is present, the appearance is sometimes slight. Recourse, therefore, is had to chemical tests.

These can be applied with certainty, only when a portion of arsenic has been procured, either from the contents of the stomach discharged by vomiting, or from its contents carefully collected and examined after death. Any indication of its presence is scarcely to be obtained by a chemical examination of the fluids of the stomach, or of the fluid discharged; more care, therefore, is requisite in collecting any solid arsenic, which is done by minute inspection of the inner surface of the stomach, and by washing it carefully, and allowing the matter to subside from the fluid, or from the fluid which had been discharged by vomiting. The arsenic being of considerable specific gravity, more easily separates by subsidence from the other matter; and if a very minute quantity be procured, the necessary

experiments may be performed on it with perfect precision, using the precaution of dividing it, and operating on different portions.

The first experiment is to attempt the reduction of the substance procured to the metallic state. A little of it may be mixed with an equal weight of the black flux, or with half its weight of charcoal powder. The mixture being put into a slender glass tube, coated with clay, and closed with a clay plug, on being raised to a low-red heat, by placing the tube over a charcoal fire, the oxide will be reduced, and the metal being volatilized, will form a brilliant crust on the internal surface of the tube. No other substance will present the same appearance but arsenic; the result therefore is decisive, and the only deficiency of the test is, that it is not the most delicate, a grain or two of the oxide at least being required to operate on.

A little either of the reduced metal in powder, or of the white arsenic made into a soft paste with black flux and oil, being placed between two clean pieces of copper, and secured by an iron wire twisted round, after exposure of the pieces to a red heat for ten minutes, they will be found permanently whitened on the surfaces which had been in contact with the arsenic. To render the white colour more evident, the surface should be rubbed with a little chalk. This test, however, is not a very delicate one.

If a little of the arsenic be dissolved in hot water, with three times its weight of carbonate of potash, on adding this solution to a warm solution of sulphate of copper, a precipitate of a lively green colour will be formed. It is necessary to be aware, that the carbonate of potash alone will throw down a precipitate from sulphate of copper, of a bluish-green colour, and it is therefore proper that the two experiments should be performed together, that the greenness of the colour produced by the arsenic should be rendered more apparent by comparison.

A test of great delicacy proposed by Mr. Hume, is that of nitrate of silver. If a stick of the fused nitrate, or lunar caustic, be applied to the surface of a solution of so small a quantity as a grain of oxide of arsenic with a grain of carbonate of soda in ten ounces of distilled water, a bright yellow precipitate is thrown down. In this manner, the sixtieth part of a grain may be detected in ten ounces of water. Dr. Marcet employed a similar test,—applying to the surface of a fluid containing oxide of arsenic in solution, a glass rod dipt in water of ammonia, and then another rod dipt in solution of nitrate of silver; a precipitate of a lively yellow colour falls down: it is necessary to avoid an excess of ammonia, as this retains it in solution. Mr. Hume has greatly increased the certainty of this test, by the formation of the ammoniaco-nitrate of silver, which, while it obviates the necessity of ascertaining the precise quantity of ammonia required, does not at all disturb the phosphoric salts. The salt is prepared in the following manner: ten grains of nitrate of silver are dissolved in ten times their weight of distilled water; then liquid ammonia is gradually dropt upon the solution, until a precipitate falls down; and the ammonia is cautiously added until the precipitate is nearly re-dissolved. In this manner an excess of ammonia is guarded against. The other mode has appeared to me to afford a more delicate test, and one less likely to fail in common use. Carbonate of soda alone, indeed, gives a precipitate with nitrate of silver; but the colour of this is not yellow, like that when the arsenic is present. The precipitate is a compound of oxides of silver and arsenic. This and

the two preceding experiments ought to be made in day-light, that the shades of colour may be better perceived.

In the test proposed by Dr. Marcet, a fallacy may arise from the presence of a phosphoric salt, which throws down a yellow precipitate from the nitrate of silver. Dr. Paris has proposed a very simple mode for obviating the difficulties likely to arise from the presence of any of the phosphoric salts. Instead of conducting the trial in a glass, the suspected liquid is to be dropped on writing paper, marking a broad line with it; along this line, a stick of the nitrate of silver is to be slowly drawn, and a streak will be immediately produced, resembling that in colour known by the name of Indian yellow: this yellow streak will arise equally from the presence of arsenic, or a phosphoric salt, but in less than two minutes a most unequivocal mark of distinction will appear. If the yellow arises from the presence of a phosphoric salt, it will soon fade into a dirty green, and will gradually become quite black. If, however, the yellow streak should arise from the presence of arsenic, the yellow tinge will remain permanent for some time, and afterwards will become brown. This plan of investigation was repeated by Mr. Hume, and with decided success.

A test which has been much employed, is that of placing a little of the white oxide on a piece of iron red hot: it volatilizes in a white smoke; and if, before being exposed to heat, it is made into a paste with oil, it will, when evaporating, give a peculiar smell resembling that of garlic. Or by heating a small piece of the reduced metal, it will be volatilized with the the same odour. A vapour may arise, however, from the intermixture of other matter in small quantity; this, too, may disguise the smell, and there is room for the influence of imagination in judging of the odour. This test, therefore, is not much to be relied on.*

Bismuthum. Bismuth.

This metal is of a white colour, with a shade of yellow, has a foliated fracture, is brittle, fusible, capable of being volatilized, and easily susceptible of oxidation. Though it has not been received into the Pharmacopœias, it has a claim to a place in the Materia Medica, as its oxide, or subnitrate has been employed with advantage in Gastrodynia, Pyrosis, and other affections connected with debility of the digestive organs. This preparation is obtained by decomposing the solution of bismuth in nitric acid by the effusion of water; the sub-nitrate is precipitated, and is washed and dried. It is given in a dose from two to six grains, two grains being

* To the test mentioned by our author for the detection of Arsenic, the two following may be added—1. *Iodine*. This substance was originally suggested as a test by Brugnatelli, and his directions for using it are to "take a little recent wheat starch, add to it a sufficient quantity of iodine to give it a blue colour; mix a little of this blue matter with water, so as to have a blue coloured liquid. If into this liquid a few drops of an aqueous solution of arsenious acid be put, the blue colour is immdiately changed to a reddish brown, and is gradually dissipated entirely. If a few drops of sulphuric acid be now added, the blue colour is again restored." Annals of Philosophy. 2. *Chromate of Potash*. This test was proposed by Dr. James Cooper of South Carolina. He directs the 16th part of a grain of white arsenic, or any portion of a grain that may be distinctly visible by the naked eye, to be put into a wine glass or watch glass, and upon this drop one or two small drops of chromate of potash, whereof the excess of alkali has been neutralized by nitric or acetic acid, according to the usual process of the manufactures of chromate of lead. In three hours, a decided green colour will be produced. The arsenic here attracts oxygen from the chromic acid, which is thus converted into green oxide, and forms a precipitate; the alkali combines with the acid of the arsenic. Beck's Medical Jurisprudence. *Ed.*

given twice or thrice a-day, or in more severe cases, five grains being given at once. In these doses, it scarcely produces any other sensible effect than a remission of pain, and ultimately a removal of the morbid state from which this has arisen.

Barytes. Terra Ponderosa. Barytes.

This earth is found in nature combined with sulphuric acid, and with carbonic acid. The native carbonate was known to prove poisonous to animals, and the degree of activity which this indicated, suggested the application of it to medicinal purposes. The form under which the barytes has been used, is in combination with muriatic acid; for the preparation of which two processes are inserted in the Edinburgh Pharmacopœia: one consists in decomposing the carbonate by muriatic acid; the other in decomposing the sulphate by heating it with charcoal, and adding muriatic acid to the solution obtained by washing the residual matter with water. The muriate in either case is obtained by crystallization, and a formula is given for a solution of it to be medicinally employed, in which one part of the salt is dissolved in three of water. It is a substance of great activity, acting as a poison when given in too large a quantity: it occasions reduction of the force of the circulation, insensibility, and paralysis, and on dissection the stomach is frequently found inflamed. The same effects arise from its application to a wound, and with great rapidity; the symptoms indicate the brain principally to be affected, and on dissection, if a large quantity has been applied, that organ is found inflamed; the motion of the heart is also diminished; the stomach is sometimes, but not always, slightly inflamed. It is detected by sulphuric acid, which forms a white precipitate, insoluble in nitric acid, or by adding the nitrate of silver, when a curdled precipitate will be formed, insoluble in water and nitric acid. When it has been taken as a poison, diluents should be given, holding the sulphate of soda or magnesia in solution, and vomiting should be excited. Medicinally, barytes has been employed as a remedy in scrofula, in cancer, some forms of syphilis, and in hectic fever connected with ulceration. Its sensible effects, where advantage has been derived from it, have been, improving the appetite and general strength; sometimes it occasions diaphoresis or diuresis, and in an over-dose is liable to produce nausea, tremors, and insensibility. Its usual dose is 5 drops of the saturated solution, gradually increased to 20 or more. Its virtues have been either overrated, or its mode of administration not properly conducted, as it has fallen into disuse.

Calx. Lime.

This earth exists in nature combined with carbonic and other acids. From the native carbonate, it is obtained by expelling the carbonic acid by heat. It is soluble in water in small quantity; the solution has a styptic taste, and is the form under which lime has been medicinally employed. Lime Water,* as it is named, is used with advantage in dyspepsia; its beneficial effects arise principally from its tonic and astringent quality, as in the small quantity which water can dissolve, it can have little effect by any

* *Incompatible Substances.* All alkaline and metallic salts, borates, tartrates, citrates, sulphur, spirituous preparations, and the infusions of all astringent vegetables. It should be kept in close vessels, for, if exposed to the air, the lime will attract the carbonic acid, and become an insoluble carbonate: the addition of an *alkaline carbonate* produces the same effect instantaneously. Paris. *Ed.*

chemical agency in obviating acidity. It is employed, too, as an astringent in chronic diarrhœa and in leucorrhœa. Carbonate of lime is used as an antacid: and phosphate of lime has, from theoretical views, been proposed as a remedy in rickets and mollities ossium. Muriate of lime is a more active substance, and more powerful tonic; it is prepared according to a formula given by the Edinburgh and Dublin Colleges, by decomposing carbonate of lime by muriatic acid, and is obtained in the state of a saturated solution. In its action on the system, it has a considerable analogy to muriate of barytes, and, like it, has been used in scrofula and hectic fever, and in dyspepsia. Its dose is half a drachm of the saturated solution; and as it is a medicine of considerable activity, it requires to be given with caution. Like other saline substances designed to act on the general system, it is probably most successful when administered in small doses, with large dilution, as in large doses, and a more concentrated state, its absorption is counteracted, and its action is confined to the intestines. Hence, probably, the greater benefit derived from it in scrofulous affections under the form of mineral waters, of which it is not unfrequently an ingredient.

The two following substances, though not strictly belonging to the mineral kingdom, may be associated with the preceding tonics, as connected with them by chemical relations.

Acidum Nitricum. Nitric Acid.

This acid is the product of the saturation of nitrogen with oxygen, and consists of 29.5 of the former, and 70.5 of the latter. It is obtained by decomposing nitrate of potash by sulphuric acid, assisted by heat; the sulphuric acid combines with the potash, and the acid of the nitre distils over in the state of nitrous acid; this, exposed to a gentle heat, loses the portion of nitric oxide gas loosely dissolved in it, and is converted into nitric acid. It is colourless; emits white fumes; its specific gravity is 1.55; is corrosive, acts with energy on inflammables and metals from parting with oxygen readily, and is eminently possessed of all the acid properties.

The tonic powers of this acid are conspicuous in supporting the system under the irritation of a mercurial course. As a remedy against lues venerea, it was some years ago introduced into practice, and received an extensive trial. Very discordant opinions were for a time maintained with regard to its powers, but the question appears now to be sufficiently determined. There can be no doubt that the primary symptoms of syphilis are often removed by its use, and that even the secondary symptoms are alleviated, or altogether disappear; venereal ulcers heal, enlargements of the glands subside, venereal pains become less severe, eruptions become less vivid or entirely fade, and the vigour of the system is improved. But even in producing these effects, nitric acid frequently fails, and it appears to be established, that when it has removed the symptoms, its action is not in general sufficiently powerful or permanent to eradicate the syphilitic poison; the symptoms recur, or the disease appears, after some time, in one or other of its secondary forms.

Though in this respect, however, nitric acid is inferior to mercury, and cannot be relied on alone in the treatment of syphilis, there are other important indications which it fulfils, and which render it a remedy of value. It supports the strength of the system under the irritation of mercury, and wherever this remedy requires to be given to a considerable

extent, is in this respect advantageous; it appears even to promote, in many cases, the operation of mercury; symptoms, especially those of constitutional affection, disappearing under their combined administration, which are more slowly removed, or resist the administration of the latter alone. In cases, too, where from circumstances mercury cannot for a time be given to the requisite extent, the symptoms are arrested by the use of the acid, or where some secondary symptoms, ulceration of the throat in particular, are making a rapid progress, they are more speedily checked when it is given; though still in these cases the precaution is proper, of employing as much mercury as would have been judged necessary alone for their removal. Lastly, in symptoms occurring during a protracted mercurial course, probably arising from the excessive use of mercury, and aggravated rather than removed by its continuance, much benefit is derived from the acid; and it sometimes succeeds in the removal of obstinate sores, when all other remedies, local and constitutional, have failed.

There are other diseases in which it is administered with advantage, particularly in that chronic affection of the liver frequently arising from residence in a warm climate, in dyspepsia, with the view of relieving sickness and anorexia, and in obstinate cutaneous eruptions. Its medium dose, in its continued administration, is from one to two drachms in twenty-four hours; the latter quantity in general cannot be exceeded, without nausea or griping being produced. It is given largely diluted with water, adding usually a little sugar, so as to form a beverage not unpleasant.

Oxy-murias Potassæ. Oxy-muriate of Potash.

This salt, which, strictly speaking, is the Hyper-oxymuriate of Potash, is prepared by introducing a current of oxymuriatic gas into a solution of potash. This is decomposed, one portion of it yielding oxygen to the other; the one returns to the state of muriatic acid, the other becomes hyper-oxymuriatic acid, and common muriate and hyper-oxymuriate of potash are formed, the latter separating by crystallization in brilliant white plates. The process has been introduced into the Dublin Pharmacopœia.

As a remedy, hyper-oxymuriate of potash may be classed with nitric acid, and it was the hypothesis of nitric acid acting medicinally by imparting oxygen to the system, that led to its medicinal use; that salt containing a large quantity of oxygen, which is not retained in it by a strong affinity. Its operation in checking or removing the symptoms of syphilis is similar; it also increases the force of the circulation, and excites the actions of the system. Its efficacy as an anti-venereal remedy was inferred, from the trials made of it, to be superior to that of the nitric acid, but it does not appear to be equally advantageous as an auxiliary to mercury. Hence, as its operation alone cannot be relied on for certainty, and as it frequently fails, it is little employed, while nitric acid still continues to be used with the views already stated. The dose in which the oxymuriate has been given, is 10 grains three or four times a-day, and increased gradually to 20 or 25 grains.

[Aurum. *Gold.*

It is unnecessary to dwell upon the physical and chemical properties of this metal. As a medicine it appears to have been known as early as the times of the Arabians, and is even said to have enjoyed among them no inconsiderable popularity. Subsequently to this it seems to have lost

all its reputation, and it had for a long time been struck from the list of medicines, when a French physician of Montpellier, Dr. Chrestien, revived its use, and in 1811 called the attention of the public to it in a work entitled "*De La Methode Jatraleptique*," in which he proposes gold as a *new remedy for the treatment of venereal and lymphatic disorders*. According to the representations contained in this work, it would appear as the result of a lengthened experience on the part of the author, that Gold is capable of curing syphilis under all its various forms; and that moreover it possesses many and decided advantages over mercury. Its effects upon the system are efficacious and gentle. It produces no salivation—nor does it in any way disturb the general health during its use, the only sensible effects produced by it being an increase of urine and of perspiration. It may be administered with perfect safety at any season of the year, and under any complication of the disease. Persons of either sex may be put upon its use with equal security. The only precaution which he enjoins during its administration is the strict observance of temperance. In other respects the patient is not required to change his accustomed mode of living.

In addition to its antisyphilitic virtues, Dr. Chrestien recommends the use of gold in glandular swellings, gleets, schirrus of the womb; in the latter complaint more especially, he speaks of its efficacy in a tone of great decision. Very shortly after the appearance of this work in France, our distinguished countryman, Dr. Samuel L. Mitchill made the medical public in this country acquainted with its contents, and immediately commenced a series of experiments with the gold in the New-York Hospital. The result of his experience is contained in the following letter addressed to the late Dr. Dyckman: "The efficacy of the medicine has been tried year after year in the New-York Hospital. My practice with it there, has been witnessed by all the attendants of the wards It possesses admirable virtues against syphilis. Without presuming to affirm, that it is capable of eradicating the distemper in every instance, my opinion upon the whole is that the muriate of gold will effect all that is achieved by muriate of quicksilver, with incomparably less inconvenience to the patient. He gets well under the operation of the former without the hazard of a sore mouth, or a salivation, and with very little wear and tear of constitution. I consider the introduction of this preparation into common use, as one of the greatest improvements in modern medicine: and I wish it was already as universal as the malady it is intended to remove. The muriate of gold is found to increase the quantity of urine, in many instances, to such a degree, that it ought to be ranked among the diuretics of the Materia Medica." In 1812 an inaugural dissertation "on the Medical properties of Gold" was published in this city by Dr. J. C. Cheeseman, in which are detailed a number of cases of primary syphilis which had been successfully treated by this remedy in the New-York Hospital; and since that period a still larger number of successful cases have been reported at that institution. The results of the whole experience on this subject at the New-York Hospital seem to be these:

1. In the treatment of primary Syphilis muriate of gold possesses powers fully equal to those of mercury.

2. In cases cured by gold secondary symptoms do not supervene more frequently than in cases which have been cured by mercury.

3. In secondary Syphilis gold is not to be depended upon for a radical cure.

Having never had occasion to administer the gold myself, I am unable from my own experience either to confirm or to contradict the preceding testimony, I am, however, acquainted with more than one physician in this city who is in the constant habit of using this remedy, who expresses himself entirely satisfied with its effects. At the same time it is proper to mention that very opposite opinions are maintained by some of our most respectable physicians.

I am inclined to believe that much of the discrepancy which pervades the testimony in relation to this subject may be accounted for by the fact already noticed, that it is only in its primary stage that gold is adequate to the cure of syphilis. Be this as it may, I cannot doubt that this metal has been successful in eradicating the venereal virus from the system without the aid of mercury or any other remedy.

With regard to its use in other diseases our knowledge is more limited. By Dr. Eberle it was administered in a case of scrofula, and succeeded in healing very rapidly the ulcerations. The cure, however, he states, was not permanent.

From its very decided diuretic properties much was expected in the treatment of dropsies, and in a few cases it has been attended with the happiest effects. The late Dr. James Low, of Albany, relates that he tried it in a well marked case of ascites, and that it "was attended with more than the expected success." In the New-York Hospital a similar result has followed its exhibition. In the management of certain forms of dropsy, therefore, I am inclined to believe that it may become a very valuable auxiliary.

Various preparations of the metal were tried by Dr. Chrestien—as the metallic divided gold—oxide of gold precipated by potash—oxide precipitated by tin—triple muriate of gold of soda—and these were applied by friction to the gums.—In this country the medicine has been given internally, generally in the form of the muriate.

The method of preparing it according to the Pharmacopœia of the United States is the following, viz. take of pure gold, any quantity. Dissolve it by means of a moderate heat, in a mixture formed by uniting one part of nitric acid, with two parts of muriatic acid ; evaporate the solution to dryness by a gentle heat ; add to the residuum an equal weight of muriate of soda, and mix them thoroughly together. Dissolve the mixture in distilled water, and evaporate slowly to dryness. Collect the mass and keep it in a glass-stopped phial, which should be accurately closed and preserved from the action of light. The dose of the muriate is from one fifteenth to one fourth of a grain, given in pills every six, eight, or twelve hours, according to circumstances.—B.]

TONICS FROM THE VEGETABLE KINGDOM.

The tonic power of vegetable substances is intimately connected with certain sensible properties which they possess, particularly with bitterness and the aromatic quality. In those tonics in which these qualities are blended, they are their most distinctive properties ; and in those vegetables in which either of them is predominant, we discover a degree of to-

nic power, or at least of that stimulating operation on which this power depends.

The vegetable products in which bitterness, without any other sensible medicinal quality, predominates, have more or less of a tonic power; the stimulant operation on which this is dependent, seems, however, to be not much extended over the system; hence bitters have scarcely any sensible effect in augmenting the force of the circulation or the heat of the body, in increasing the secretions, or in stimulating to action any particular part: their operation is principally in giving vigour to the stomach, and other digestive organs, and obviating those symptoms connected with debility of these organs. Still their operation is not entirely local; they prove tonic to the general system, not only indirectly by their action on the stomach, but by a more direct operation. This is displayed in their power of removing diseases connected with general debility, as intermittent fever, or the different species of dropsy, particularly anasarca, which so frequently depend on diminished energy of the absorbents. The injurious consequences which sometimes arise from the use of bitters too long continued, afford another proof of their action on the general system.

Bitterness in vegetables has been supposed to reside in a peculiar proximate principle, which has been named the Bitter Principle. This opinion, however, is vague, and rests on no sufficient evidence. The quality of bitterness may reside in any of the known principles of vegetable matter; in many of the bitters of the Materia Medica it appears to be connected with extractive matter, as it is obtained equally by the action of water and alcohol; it is not volatile, and in general is not much impaired by decoction.

Aromatics are more rapid and diffusible in their action; they stimulate the general system and augment the force of the circulation; but this is scarcely sufficiently permanent to admit of their being administered with advantage as tonics. They are therefore rather employed as temporary stimulants, to obviate debility of the digestive organs, or as promoting the action of bitters. Still, as strictly connected with the substances belonging to this class, I have not hesitated to place them under it. There is one general virtue they possess, and for which they are often used, that of preventing or relieving nausea; this they do partly from their agreeable taste and odour, and partly probably from their stimulant operation on the stomach. The aromatic quality in general resides in their essential oil; hence it is communicated both to water and alcohol by infusion; their oils are usually pungent and stimulant, and their distilled waters and spirits partake of these powers.

From the qualities which bitters and aromatics possess, the stimulant operation of the one being slow and permanent, that of the other being more diffusible and transient, it might be inferred, perhaps, that their combination will afford a superiority of tonic power. In the most powerful vegetable tonics, accordingly, these qualities are generally blended; these may be placed first, and from them there is a series to the more pure bitters and aromatics.

Cinchona Officinalis. *Cortex Peruvianus*, Cinchona. Peruvian Bark.
Pentand. Monogyn. Contortæ. Cortex. Peru.

The natural history of the genus Cinchona was, until lately, imperfectly elucidated. Linnæus had described a species under the name of Cinchona Officinalis; the characters of which were indistinctly given un-

der this general name. The Edinburgh College having inserted in their catalogue of the articles of the Materia Medica, the three kinds of Peruvian bark at present met with in the shops, the Common or Yellow, the Pale, and the Red, distinguished by the names of Cinchona Cordifolia, Lancifolia, and Oblongifolia. The species of this genus, it now appears, are numerous, and many of them natives of Peru. The subject has lately been investigated by Mutis and Zea, and on their authority the London College have inserted three species, Cinchona Lancifolia, Cinchona Oblongifolia, and Cinchona Cordifolia; the first furnishing the pale bark, the second the red, and the third the yellow bark of the shops. They are natives of different provinces of Peru.

These barks appear to be procured and prepared in a similar manner. The bark is stripped from the trunk and branches, during the dry season; it is dried by exposure to the sun, and after being imported into Europe, is sorted by separating the finer from the coarser.

The Pale Bark is considered as the bark of the Chinchona Lancifolia of Mutis, though it is very probable that, as it occurs in commerce, it is also furnished by other species. The tree producing it is found in the mountains of Quito and Santa Fe; what is brought from Loxa is regarded as of superior quality; the best kind met with in the shops is in thin pieces, singly convoluted, forming small quilled twigs, internally of a cinnamon colour, smooth but fibrous in the texture; externally it is covered with a thin epidermis of a greyish-brown colour, to which a crust of lichen sometimes adheres; it breaks close and smooth, and is friable between the teeth; its powder is of a pale colour. There are often intermixed with this, what is considered as bark of inferior quality, in thicker pieces, flat, or very little convoluted, rougher externally, and of a more distinctly fibrous texture. The taste of pale Peruvian bark is bitter, and slightly astringent; its flavour is slightly aromatic, with a degree of mustiness.

The Red Bark is the bark of the Cinchona Oblongifolia of Mutis, a tree of considerable size, which grows on the Andes. It is in large thick pieces, usually flat, though sometimes quilled, externally covered with a brown rugged epidermis, internally more smooth and compact, but fibrous, the fibres being coarse, of a dark red colour; its taste and smell are similar to those of the pale, but the taste is rather stronger, and more astringent. It first appeared in Europe about the year 1780.

The Yellow Bark, so named, not from its colour being distinctly yellow, but because it approaches more to that than the colours of the others, is the bark of the Cinchona Cordifolia of Mutis. It was imported as a new variety, about fifteen years ago, but it has been stated to be that which was first known, though the importance of it had ceased, and to be therefore the real Peruvian Bark. It is in flat pieces, not convoluted like the pale, nor dark-coloured like the red; is externally smooth, internally, of a light cinnamon colour, friable, and fibrous; it has no peculiar odour different from the others, but a taste much more bitter, with scarcely any sensible astringency.

Cinchona has often been subjected to chemical examination. but its constituent proximate principles are still far from being well determined. This indeed appears to be attended with peculiar difficulties, from the different species containing different principles, and from the nature of some of these being not well ascertained.

The basis of all of them is the ligneous fibre, constituting the greater part of their weight, but to this are attached various principles capable

of being extracted by different solvents. Cold water infused on pale bark for some hours, acquires a bitter taste, with some share of its odour; when assisted by a moderate heat, the water takes up more of the active matter; this infusion is transparent while warm, but as it cools becomes slightly turbid; by decoction, a fluid, deep coloured, of a bitter styptic taste, is obtained, which, when cold, deposites a precipitate soluble in alcohol. By long decoction, the virtues of the bark are nearly impaired or destroyed, owing to the chemical change and precipitation of its active matter. Alcohol is a more powerful solvent of its active principles than water, the tincture being of a deeper colour and stronger taste, and holding more matter dissolved. Brandy and other spirits and wines afford strong solutions in proportion to the quantity of alcohol they contain. A saturated solution of ammonia is a powerful solvent; vinegar is less so than water. By distillation, water is impregnated with the flavour of bark; but it is doubtful whether any essential oil can be obtained.

The action of menstrua on the red bark is nearly the same, the solutions being rather stronger, or containing a larger quantity of the matter which is precipitated from the decoction as it cools, and which is more peculiarly soluble in alcohol, this matter being apparently composed of the principles in which the activity of the bark resides.

The analysis of the yellow bark shows that its active principles are more powerful than in either of the others; its infusions in water, alcohol, &c. are at least more bitter.

It is not easy to determine from these results, the nature of the principles extracted, or what relation they have to the powers of the bark. As the active matter appears to be more soluble in hot than in cold water, being partially precipitated from the former as it cools, and as it is still more soluble in alcohol, it might be concluded to be of a resinous nature. Being soluble to a certain extent, however, in water, and suffering a partial decomposition when boiled under exposure to the air, it may also be considered as approaching in its characters to extract.

Besides this, from the effects of re-agents, Peruvian bark has been considered as containing a quantity of astringent matter, and this appears to have some relation to the matter extracted by water with the aid of heat, and by alcohol. On adding a solution of sulphate of iron to the infusion, a deep colour is struck, not purple indeed like that produced by the action of that test on the vegetable astringents, but rather of a dark olive green; the same colour is deeper when the salt is added to the decoction, or the tincture. This was regarded as a proof of the presence of the astringent principle or tannin, and hence it might be inferred, that a precipitate would be produced by the addition of gelatin. This accordingly happens with some kinds of Peruvian bark; a solution of gelatin added to the infusion giving a precipitate more or less copious But the singular fact has been discovered, that there are other varieties which do not precipitate gelatin; and that even as Dr. Maton observed, a precipitate is produced with tannin, or a least with infusion of oak-bark, or of infusion of galls. This latter result Seguin considered absurdly as depending on the presence of gelatin, and pretended that gelatin exerted the specific power of Peruvian bark on the system, so that with animal glue he had cured intermittent fever. Dr. Duncan inferred, that the precipitation with tannin is owing to the presence of a peculiar principle of vegetable matter not before observed, to which he gave the name of Cinchonin. Vauquelin, in his analysis of the different species of Peruvian bark, found generally

that their aqueous infusion gave a precipitate both with tannin and gelatin; some, however, gave no sensible precipitate with gelatin, while they precipitated tannin. Among these, he ranks the common pale bark. Others again did not precipitate tannin, but formed a precipitate with gelatin. His observations, however, are of less value, as, although deduced from experiments on seventeen species, as he calls them, of cinchona, these are not distinguished by their specific characters, and we therefore scarcely know to what the observations apply. From the intermixture of different kinds of Peruvian bark in commerce, and the uncertainty of their uniformity, it is not easy to determine what species more peculiarly afford this principle. I have found that the watery infusion of the pale bark is not sensibly precipitated either by gelatin or tannin; that of the red bark is not precipitated by gelatin, but gives a copious precipitate with tannin; and that of the yellow is rendered turbid by gelatin, and precipitated copiously by tannin.

There is a difficulty in determining the nature of the principles on which these phenomena depend,—either that which gives a precipitate with gelatin, or that which is precipitated by tannin, if these differ from each other. In a dissertation by B. A. Gomes, a process is given to obtain cinchonin pure, and its qualities in this state are described as different in several respects from those which had been assigned to it. The process consists in evaporating tincture of bark to the consistence of an extract, adding to this successively small portions of distilled water, while any colour or taste is acquired: filtering these solutions, then evaporating them, and adding to the solid matter successive portions of a solution of potash, until these come off colourless. A white substance is thus obtained, which is washed with a small portion of cold water. When dry it forms a powder, which is nearly pure cinchonin. By dissolving this in alcohol, straining the solution, adding to it an equal quantity of distilled water, leaving it exposed to the air until the alcohol evaporates, straining the residual liquor, and allowing the solid deposite to dry on the filtre, the cinchonin is obtained in fine white filiform crystals. These are described as insipid and inodorous, inflammable, insoluble in water, cold or warm, soluble in alcohol, ether, and in acids, and yielding a precipitate from solutions in acids, on the addition of infusion of galls, which is re-dissolved by alcohol. This principle, as Gomes remarks, is analogous to resin in its inflammability, insolubility in water, and solubility in alcohol and ether; but it differs by its crystallization, and its solubility in acids. In these, as well as in the other properties, it bears a more close resemblance to camphor; but it differs from it in want of odour, in greater specific gravity, as it sinks in water, and in giving a precipitate with infusion of galls. The solubility of this principle in water, as it exists in cinchona, must, according to this statement, be owing to principles with which it is combined.

It does not clearly appear what relation these principles of Peruvian bark, whether cinchonin, or that which gives a precipitate with gelatin, have to the matter in which the active powers of the cinchona reside. It may be concluded, however, that they are not essential to it, since they are in sparing quantity in pale bark, and since they are not uniform in the other species in any relation to the medicinal qualities. The same facts prove, that they have no relation to the resino-extractive matter, the principle probably of greatest activity of any which bark contains,

Gomes affirms, however, that cinchonin is contained in all the varieties of cinchona which are febrifuge, and that in those which are are not it is wanting.

The cinchonin, or active principle of the barks, first noticed by Dr. Duncan, Jun. appears, from the experiments of Pelletier and Caventou, to exist in them combined with a peculiar acid, called the Cinchonic; it is thus an alkali combined with an acid, and its properties are said to be as follows:—it is transparent, white, and crystallizable, nearly insoluble in water, as it requires 7000 parts for its solution: dissolved in an acid or alcohol it has the bitter taste of the barks, and in the fixed or volatile oils, it dissolves only in small quantities; from analysis it appears to contain oxygen, hydrogen, and carbon. As a base it combines with the acids, forming neutral salts. Of these the sulphate of cinchona is the most important, from its having been employed as a remedy in intermittents. Fouquier, Magendje, Chomel, and several other French physicians, have employed it as a remedy in intermittents, and found it equal, if not superior, to bark administered in the usual way, in preventing the recurrence of the febrile paroxysm. In one of the late Numbers of the *Revue Medicale*, a full account is given by M. Double of the effects produced by this salt employed in similar cases; and from the results he obtained it is inferred, that the virtues of cinchona depend on the cinchonin combined with the peculiar acid called the cinchonic, and that the neutral salt, the sulphate of cinchonin, acts more powerfully as a remedy against intermittents, than bark administered in any other form whatever. Ten grains of the salt given in divided doses, are considered sufficient to prevent the recurrence of the febrile paroxysm.

The infusions of some varieties of bark redden the more delicate vegetable infusions; and Vauquelin has discovered in the matter extracted by water with the aid of heat, a salt composed of lime, with a peculiar crystallizable acid, which he has named Kinic Acid.

The active matter of bark is rendered more soluble in water by acids, a circumstance of some importance in its pharmaceutic preparation. The alkalies also add to its solubility; and some of the earths, particularly lime and magnesia, have the same effects.

The comparative medicinal activity of the different kinds of Peruvian bark is not easily determined, owing to the variable state in which they are found in the shops. The red, at its first introduction. was represented as much superior in efficacy to the pale, and this appeared to be confirmed by chemical experiments on the proportion of active matter in it to that of the ligneous fibre; but there is some reason to doubt of this superiority with regard to the red bark now usually met with. The yellow bark has a much greater degree of bitterness, and some clinical observations appear to establish its superior medicinal power. According to Mutis and Zea, it is far superior to the other species in curing intermittent fever, and they regard it as the only species directly febrifuge. If even its superiority be admitted, its intense bitterness renders it unpleasant, and liable to occasion nausea, at least unless it be taken in a dose inferior to that of the other.

The effects of Peruvian bark are those of a powerful and permanent tonic, so slow in its operation as to be scarcely perceptible by any alteration in the state of the pulse, or of the temperature of the body. Its tonic power is inferred, therefore, principally from obviating states of debility; and it is one of those medicines, the efficacy of which in removing

disease is greater than could be expected, *a priori*, from its effects on the system in a healthy state. The only effects from too large a dose, are nausea and headach.

Intermittent fever is the disease for the cure of which bark was introduced into practice, and there is still no remedy which equals it in power,—a superiority of which, from its known operation, it is difficult to give any explanation. Little diversity of opinion now exists with regard to the rules regulating its administration. It is given in the earliest stage of the disease, and without any previous preparation, farther than the exhibition of an emetic to evacuate the stomach. And it may be employed with safety and advantage in every period of the fever. It has been supposed more effectual when given before the recurrence of the paroxysm, and that, from this mode of employing it, less is required for that cure. The usual practice, however, is to give it in doses of a scruple or half a drachm every fifth or sixth hour during the interval of the paroxysm; it may be even given with safety during the hot fit, but is then more apt to excite nausea. It requires to be given for some time, and continued after the fever has been removed, in order more effectually to guard against a relapse.

In remittent fever it is given with equal freedom, even though the remission of the fever may be obscure, and frequently with advantage. The remissions become more distinct, and the febrile state is at length subdued. And in all those obscure and often protracted forms of febrile affection, which observe periodic exacerbations, it is often beneficial.

In those varieties of continued fever which are connected with debility, as in typhus, cynanche maligna, and confluent small-pox, &c. Peruvian bark has been regarded as a valuable remedy. It is difficult, however, to give it in such quantities as to obtain much sensible effect from it, as from the weakened state of the organs of digestion, it remains in the stomach unaltered, and is liable to produce nausea and irritation. In modern practice, therefore, bark is less employed in typhus than it was at one period, preference being given to the more powerful exciting operation of opium and wine. It has been regarded as even hurtful in those forms of fever where the brain or its membranes are inflamed, or where there is much irritation, marked by subsultus tendinum, and convulsive motions of the extremities. Advantage is sometimes derived from it in the convalescent stage of the disease.

Even in fevers of an opposite type, where there are marks of inflammatory action, particularly in acute rheumatism, bark has been found useful, blood-letting being generally previously employed.

In erysipelas, in gangrene, in extensive suppuration, and in scrofulous and venereal ulceration, the free use of cinchona has been regarded as of the greatest advantage. In some of these diseases, however, the slowness of its operation renders it less effectual, and this is not easily obviated by any increase which can be made in the dose.

In the various forms of passive hæmorrhage, in many other diseases of chronic debility, dyspepsia, hypochondriasis, paralysis, rickets, scrofula, dropsy, and in a variety of spasmodic affections, epilepsy, chorea, and hysteria, cinchona is administered as a powerful and permanent tonic, either alone, or combined with other remedies suited to the particular case. The more common combinations of it are with sulphuric acid as an astringent, with preparations of iron as a tonic, with mercury in syphilis, in spasmodic diseases with valerian, and with cicuta in scrofula and extensive ulceration.

Its usual dose is half a drachm. The only inconvenience of a larger dose is its sitting uneasy on the stomach. It may therefore, if necessary, be frequently repeated, and in urgent cases may be taken to the extent of an ounce or even two ounces in twenty-four hours, though from such large doses probably no adequate advantage is derived. If it excite nausea, smaller doses may be taken and repeated more frequently, and may be reconciled to the stomach by the addition of any grateful aromatic.

The powder is more effectual than any of the preparations; it is given in wine, or in any spirituous liquor diluted with water, sometimes in milk, especially in butter-milk, or diffused in water by the medium of syrup or extract of liquorice. For particular purposes different preparations are employed. The cold infusion is the least powerful, but is grateful and sits easy on the stomach: it is however so weak, that it is scarcely used but as a bitter in dyspepsia. Prepared by previous trituration of the bark with a little magnesia, it is rather more active. The decoction contains more of the active matter of the bark, and is the preparation generally used when the powder is rejected; its dose is from 2 to 4 ounces; but it cannot be relied on for any important effect. The spirituous tincture, though containing more of the active principles, cannot be extensively used on account of the menstruum, but is principally employed occasionally, and in small doses of 2 or 3 drachms, as a stomachic. The extract is a preparation of some power, when prepared by the joint action of alcohol and water; but as this is expensive, the watery extract is usually found in the shops, and is very variable in strength. It is given in the form of a pill, in a dose from 5 to 15 grains, and affords the best form for combining bark with iron.

Bark is sometimes given in the form of enema; a scruple of the extract, or 2 drachms of the powder, being diffused in 4 ounces of starch mucilage. The decoction is sometimes applied as a fomentation to ill conditioned ulcers, or the powder is sprinkled on the ulcerated surface.*

Offic. Prep.—Decoct. Cinch. Extr. Cinch. Inf. Cinch. Tinct. Cinch.—T. Cinch. C. *Ed. Lond. Dub.*

Cinchona Caribæa. Caribæan Bark.

This species, a native of the Caribbee Islands, belonging to the same genus with the officinal cinchona, has been proposed as a substitute for it. It is more bitter, and less aromatic, is of a brown colour, somewhat convoluted and fibrous. According to the observations of Dr. Wright, who employed it in Jamaica, its effects are similar to those of the officinal cinchona. The Cinchona Floribunda, or St. Lucia bark, has been also sometimes used. It is of a darker brown colour; its taste is sweetish, but becomes extremely bitter. It has been found more liable than the other species to produce nausea and purging.

Aristolochia Serpentaria. Serpentaria Virginiana. Virginian Snake-root. *Gynand. Hexand. Sarmentosæ. Radix. Virginia, Carolina.*

This root consists of a number of small fibres, issuing from one stem, of a greyish brown colour; it has a slightly aromatic smell, and a warm bitterish taste. Its active matter is extracted partially by water, and by

* *Incompatible Substances.* Precipitates are produced by the salts of iron, sulphate of zinc, nitrate of silver, oxymuriate of mercury, tartarized antimony, solutions of arsenic, &c. Paris. *Ed.*

alochol; entirely by proof-spirit. By distillation it affords a small quantity of an essential oil, somewhat fragrant, but not pungent.

Serpentaria is an aromatic tonic, which used to be employed in fevers of the typhoid type, to support the powers of the system. It was given in a dose of from 10 to 20 grains every fourth or fifth hour; with this intention, it is now very rarely prescribed, and in any power it has of obviating debility or febrile action, it is probably considerably inferior to cinchona. It is sometimes combined with cinchona in the treatment of intermittent fever, and it occasionally enters as an ingredient into the composition of bitter infusions and tinctures used in dyspepsia.

Offic. Prep.—T. Arist. Serpent. *Ed. Lond. Dub.*

DORSTENIA CONTRAYERVA. Contrayerva. *Tetrand. Monog. Scabridæ. Radix. Peru, West Indies.*

THIS root is in twisted fibres of a yellowish colour; has an aromatic smell, and a bitterish taste; it yields its active matter to water and alcohol. Contrayerva, like serpentaria, was formerly used as a stimulant and diaphoretic in typhoid fevers, in a dose from 5 to 20 grains, but like it too it has fallen into disuse. Mixed with carbonate of lime, it forms the compound powder of contrayerva of the London Pharmacopœia, which is used in typhus, the exanthemata, and in atonic gout.

Offic. Prep.—P. Contrayerv. C. *Lond.*

CROTON ELEUTHERIA. Cascarilla. *Monoec. Monadelph. Tricoccæ. Cortex. Bahama Islands, North America.*

CASCARILLA bark is in quills of a grey colour; has a slightly aromatic smell, and a warm bitter taste; it is highly inflammable. It consists, according to Trommsdorff, of mucilage and bitter principle 864, resin 688, volatile oil 72, water 48, woody fibre 3024—4696. It has been used as a substitute for Peruvian bark, and has been employed as a remedy in dysentery, and in obstinate diarrhœa. Its usual dose is a scruple or half a drachm, but in modern practice it is little used.

Offic. Prep.—Tinct. Croton. Eleuth. *Ed. Lond.*—Infus. Casc. *Lond.*—Extr. Casc. Resin. *Dub.*

BONPLANDIA TRIFOLIATA. CUSPARIA FEBRIFUGA. Angustura. *Pentand. Monogyn. South America.*

THIS bark was imported some years ago from the Spanish West Indies, the botanical characters of the tree producing it being unknown. These have been lately determined by Humboldt, and the London College have adopted the name Cusparia Febrifuga, in order to distinguish it. It is in flat pieces, externally grey and wrinkled, internally of a yellowish-brown colour, and smooth; it has little odour; its taste is bitter and slightly aromatic. Water, assisted by heat, takes up the greater part of its active matter, which does not seem to be injured by decoction. Alcohol dissolves its bitter and aromatic parts, but precipitates the extractive matter dissolved by water, and its solution is on the contrary decomposed by water. Proof-spirit appears to be its proper menstruum. By distillation, it affords a small quantity of essential oil. The bark, triturated with lime or potash, and water, gives a smell of ammonia. Its watery infusion gives no precipitate with gelatin; but, on the contrary, becomes turbid with infuson of galls. Its powder is powerful in counteracting putrefaction.

M. M. Pelletier and Caventou extracted from the bark of this angustura a vegetable alkali, soluble in 500 times its weight of boiling water, and in 850 of cold. It has a very bitter and acrid taste; and in the dose of a few grains is a violent poison. By a strong heat it is resolved into carbon, hydrogen, and oxygen: and it forms neutral salts with the acids. It is insoluble in sulphuric ether and the fixed oils, and is slightly soluble in volatile oils.

Angustura was originally introduced in the West Indies as a remedy in fevers, equal or even superior to Peruvian bark. In this country it has not been much employed as a substitute for Cinchona; and in the treatment of intermittent, it has in the trials that have been made of it failed. It has been used principally in obstinate diarrhœa, and in chronic dysentery, or as a remedy in dyspepsia. Its dose is from 10 to 20 grains of the powder, or one drachm in infusion or decoction. Its tincture with proof-spirit is given in a dose of one or two drachms.*

Offic. Prep.—Tinct. Bonpland. Trifol. *Ed. Dub.*—Infus. Cusp. *Lond.*

Swietenia Febrifuga. Swietenia. *Decand. Monogyn. Trihilatæ. Cortex. East Indies.*

The bark of the wood of this tree is of a red colour internally; externally it is covered with a grey epidermis; it has an astringent bitter taste; it yields its active matter to water by infusion or decoction, and by evaporation affords an extract highly astringent. It was introduced as a substitute for Peruvian bark, and in India has been used with advantage in the treatment of intermittent and remittent fever. Its dose in substance is half a drachm.

Swietenia Mahagoni. Mahogany. *Cortex. Spanish America. West Indies.*

This species, of the same genus as the preceding, has similar qualities and virtues, its bark being equally bitter and astringent. It has therefore been received into the Edinburgh Pharmacopœia, and may be employed to answer similar indications.

Colomba. (Calumba, *Pharm. Lond.*) Colomba.

Of the plant which furnishes this root, no botanical account has been obtained. It has been said to be brought from Ceylon; but from later accounts, it appears to be the produce of the Eastern coast of Africa, and to be imported from Mozambique. It is in round thin pieces, evidently formed by transverse sections of the root; the circumference of these is covered with a bark; the woody part is of a light yellow colour, spongy, and often worm-eaten. It has a faint aromatic smell, and a bitter taste. It yields its bitterness to water; proof-spirit is its proper menstruum, though the tincture is not very strong.

Colomba is a powerful antiseptic and bitter, and its bitterness is free from all nauseous flavour; it is used with much advantage in affections of the stomach and intestinal canal, accompanied with redundance of bile; it is also employed in dyspepsia, and forms a more powerful and grateful stomachic than the common bitters. Its dose is half a drachm of the pow-

* *Incompatible Substances.* Sulphate of iron, sulphate of copper, oxymuriate of mercury, nitrate of silver, tartarized antimony, sub-acetate and acetate of lead, potash, and perhaps the mineral acids, for they produce precipitates, as do also the infusions of galls, and yellow cinchona. Paris. *Ed.*

der, which, in cases of cholera or bilious remitting fever, may be repeated every third or fourth hour. When used in dyspepsia, it may be given under the form of infusion, or sometimes the root is chewed.*

Offic. Prep.—Tinct. Columb. *Ed. Lond. Dub.*—Infus. Colomb. *Lond.*

QUASSIA SIMAROUBA. Simarouba. *Decand. Monogyn. Gruinales. Cortex. South America.*

THE bark of the root of this tree, which is the part medicinally employed, is in long pieces, of a fibrous texture and yellowish colour; destitute of odour, and having a strong bitter taste. It is however variable in its sensible qualities, some specimens having scarcely any bitterness. Water and alcohol dissolve its active matter; the solution in either menstruum suffers no change from sulphate of iron.

Simarouba has been celebrated as a remedy in intermittent fever, dysentery, and chronic diarrhœa, and has been given generally in the form of decoction: in substance the dose is one scruple. Though used in the countries of which it is a native, it is with us rarely prescribed. An infusion of it has a place in the London Pharmacopœia.

Offic. Prep.—Infus. Simaroub. *Lond.*

QUASSIA EXCELSA. Quassia. *Decand. Monogyn. Gruinales. Lignum. West Indies.*

THE wood of the root of this tree is of a yellowish white colour; it has a taste intensely bitter, without any odour or aromatic flavour. The bitterness is extracted equally by water and by alcohol.

It is used as a remedy in dyspepsia, diarrhœa, and in remittent and intermittent fevers, and is also sometimes employed to check vomiting. It is given under the form of the watery infusion when employed as a bitter; in substance, in which state it has been employed in the treatment of intermittents, its dose is from 10 to 30 grains.

Offic. Prep.—Infus. Quass. *Lond.*—Tinct. Quass. *Dub.*

GENTIANA LUTEA. Gentian. *Pentand. Digyn. Rotaceæ. Radix. Switzerland, Germany.*

THIS root is in long slender pieces, soft and flexible, of a yellowish colour, with a greyish epidermis. It has a very bitter taste, without any peculiar flavour. This bitterness is extracted both by water and alcohol. Diluted alcohol is its proper solvent. The liquor obtained by decoction with water, affords by inspissation an extract intensely bitter.

From the experiments of Neumann, it appears to consist of bitter principle, mucilaginous matter, resin, and extractive, to the first of which it owes its medicinal properties.

Gentian is a common remedy in dyspepsia, in the form of infusion or tincture; as a bitter, it is more frequently used perhaps than any other, and usually forms the basis of stomachic remedies. In substance, it has been given, for the cure of intermittents, in a dose of half a drachm.

Offic. Prep.—Extr. Gent. Lut. Inf. Gent. C. Tinct. Gent. C. *Ed. Lond. Dub.*—Vin. Gent. C. *Ed.*

* *Incompatible Substances.* Precipitates are produced by the infusion of galls and yellow cinchona, sub-acetate and acetate of lead, oxymuriate of mercury, and lime-water. Paris. *Ed.*

Anthemis Nobilis. Chamæmelum. Chamomile. *Syngenes. Polygam. superfl. Compositæ. Flores. Indigenous.*

The flower of this herb is collected before it is fully expanded, and dried. There are two varieties of it obtained by cultivation, the single and double flowered: the former is much stronger than the latter, the odour and taste residing not in the white petals, but in the disk or tubular florets, which are larger in the single flowers. They have a bitter nauseous taste, and a strong unpleasant odour. The bitterness, with part of the odour, is extracted by water and alcohol, and if the infusion has been made with warm water, it is nauseous, probably from the extraction of a portion of the essential oil. This oil, strongly odorous, is afforded in a small quantity by distillation with water.

Chamomile is a powerful bitter, and as such is useful in dyspepsia, primary or symptomatic, and forms a popular remedy which is in common use. It is equal perhaps to any of the vegetable bitters, and has even a superiority in the facility with which its bitterness is extracted by water. The cold infusion is most grateful, and hence it ought to be used under this form. The infusion in tepid water, when strong, acts as an emetic, and is often used to promote the action of other emetics. In substance, it has been given as a remedy in intermittent fever, in a dose of half a drachm three or four times a-day. Externally, the flowers steeped in water are employed as a fomentation. The extract, which is intensely bitter, free from any nauseous flavour, affords a convenient bitter in the form of a pill; it is also a convenient vehicle for forming pills, especially when it coincides in virtue with the substance prescribed under that form.

Offic. Prep.—Extr. Anth. N. *Edin. Dub. Lond.*—Inf. Anth. Ol. Anth. *Edin. Lond.*—Decoct. Anthem. *Edin. Dub.*

The following plants, possessing bitterness in a greater or less degree, were formerly employed, but are now discarded from practice. They possess no virtues but those of bitters, and as they have all more or less of a nauseous flavour, gentian, columba, or quassia, is preferred to them. It is necessary to notice only their botanical characters.

Artemisia Absinthium. Wormwood. *Syngenes. Polygam. superfl. Compositæ. Herba. Indigenous.*

Chironia Centaurium. Centaury. *Pentand. Monogyn. Rotaceæ, Herba.*

Marrubium Vulgare. Hoarhound. *Didynam. Gymnosperm. Verticillatæ. Herba.*

Menyanthes Trifoliata. Trefoil. *Pentand Monog. Rotaceæ. Herba.*

Centaurea Benedicta. Blessed Thistle. *Syngenes. Polygam. frustran. Compositæ. Herba. Spain.*

The remaining substances belonging to this class are those in which the aromatic quality predominates, blended in some of them with a degree of bitterness. They are much inferior in tonic power, and a number of them are employed only as grateful stimulants to the stomach.

Citrus Aurantium. Orange. *Polydelph. Icosand. Pomaceæ. Cortex flavus Fructus; Fructus; Fructus immaturus. India.*

The Orange-tree is a native of India, but is abundantly cultivated in the south of Europe. The outer rind of the fruit, especially of that variety named the Seville or Bitter Orange, has a grateful aromatic flavour, and a warm bitterish taste, both of which depend on an essential oil, which, existing in the rind in distinct vesicles, may in part be obtained by expression, but more abundantly by distillation. It is dried for use; both taste and flavour are extracted by water by infusion, as well as by alcohol. Its qualities are those of an aromatic and bitter. It has been employed to restore the tone of the stomach, and is a very common addition to combinations of bitters used in dyspepsia, communicating to them its grateful odour, and coinciding with them in power. It has likewise been given in intermittents in a dose of a drachm twice or thrice a-day.

Offic. Prep.—Cons. Citr. Aur. Syr. Citr. Aur. *Ed. Lond. Dub.*—Aqua Citri Aurant. *Ed.*—Infus. Surant. Composit. *Lond.*

The unripe fruit of the same variety, *Aurantia Curasslaventia*, Curasso Oranges as they are named, retain when dried the aromatic flavour of the peel, with rather a larger share of bitterness, and are applied to the same uses.

The juice of the ripe fruit of the variety named the China Orange, consists principally of citric acid and saccharine matter, and so far as it has any medicinal virtue, is a refrigerant, and is to be afterwards considered.

Citrus Medica. Lemon. *Polyadelph. Icosand. Pomaceæ. Cortex fructus. Asia.*

The Lemon-tree, though a native of the warmer countries of Asia, has been long cultivated in the south of Europe. The exterior rind of the fruit contains an essential oil in distinct cells, whence it derives its aromatic quality. The dried rind is similar in flavour and taste to that of the orange, but is rather less bitter and aromatic; its flavour, too, is more perishable, and from both circumstances it is less frequently used, though it may be employed for similar purposes. The oil is in use as a perfume. The juice is strongly acid, consisting chiefly of citric acid; its medicinal applications fall to be considered under the class of refrigerants.

Offic. Prep.—Aqua Citri Medicæ. *Ed.*—Syr. Citr. Med. *Ed. Lond. Dub.*—Acid. Citric. *Lond.*

Acorus Calamus. Sweet-scented Flag. *Hexand. Monogyn. Piperitæ. Radix. Indigenous.*

This plant grows in marshy situations in this and other countries of Europe. Its root, dried and covered with the bark, is kept in the shops. It is soft, flat, and jointed; has a faint aromatic smell, and a warm bitterish taste. By distillation it yields an essential oil, in which its flavour resides; and it contains a considerable quantity of fecula. It has been used as a tonic in intermittent fever; and sometimes it enters, as an aromatic and bitter, into the composition of bitter infusions and tinctures.

Laurus Cinnamomum. Cinnamon. *Enneand. Monogyn. Oleraceæ. Cortex. Ceylon.*

This tree, a native of Ceylon, is now cultivated in India. The cinnamon is the interior bark of the branches of the tree; it is thin and convo-

luted, of a texture somewhat fibrous, friable, of a light brown colour, having an agreeable pungent taste, with a degree of sweetness, and a grateful aromatic flavour. Its virtues chiefly depend on a small quantity of essential oil which it contains, and which, obtained by distillation, is highly odorous and pungent. It yields its aromatic flavour and taste both to water, by infusion, and to alcohol; and water distilled from it has also its pungency.

Cinnamon is one of the most grateful of the aromatics. It is used to cover the unpleasant taste and flavour of other medicines, and to reconcile them to the stomach. It is also employed by itself as a moderate stimulant and cordial, given under the form of the watery infusion or distilled water. The former is more grateful, and is often successful in relieving nausea and checking vomiting.

Offic. Prep.—Aq. L. Cinn. Sp. L. Cinn. T. L. Cinn. T. L. Cinn. C. *Ed. Lond. Dub.* Pulv. Cinnamon. Composit. *Lond.*

Laurus Cassia. Cassia. *Enneand. Monogyn. Oleraceæ. Cortex. Flores nondum expliciti. India.*

The Cassia-tree has been regarded as a variety of the cinnamon, but appears to be a distinct species. Its bark resembles that of cinnamon in appearance, taste, and flavour: it is distinguished by its taste being more pungent, less sweet, and more mucilaginous, than that of the real cinnamon; by its texture being denser, or less shivery, so that it breaks close and smooth; and by the pieces of it being thicker and less convoluted. Its aromatic quality, like that of cinnamon, resides in an essential oil. It affords a distilled water, stronger than that of cinnamon, and yields also its taste and flavour to water by infusion. It is used for the same pupose as cinnamon; it is, however, much less agreeable to the stomach, and rather more pungent and stimulating. It cannot, therefore, be always with propriety substituted for the other, especially where the stomach is in an irritable state. The Cassia buds are collected before they are fully expanded, and are dried; they are of a dark grey colour, are similar in taste and flavour to the bark, and are often substituted for it in officinal preparations.

Offic. Prep.—Aq. L. Cass. *Ed.*

Canella Alba. *Dodecand. Monogyn. Oleraceæ. Cortex. West Indies.*

This is the inner bark of the branches of the tree. It is in quills or flat pieces, of a light yellowish grey colour; its flavour is somewhat aromatic, and its taste is pungent. By distillation it affords a thick essential oil. Alcohol extracts its aromatic quality, water does so imperfectly.

Canella is employed principally on account of its aromatic quality, and generally in combination with other remedies to render them more grateful. It thus enters into the composition of several officinal tinctures, and has been supposed, in particular, well adapted to cover the flavour of aloes.

Offic. Prep.—V. Aloes cum Canella. *Lond. Dub.*—Pulv. Aloes cum Canella. *Dub.*

Myristica Moschata. *Dioecia. Monadelphia. Fructus nucleus. Nux Moschata dictus; Macis; Hujus Oleum fixum. India.*

Under the officinal name Myristica, are comprehended Nux Moschata or Nutmeg, and Macis or Mace; the former being the seed or kernel

of the fruit, the latter the covering with which it is immediately surrounded. The tree is a native of the Molucca islands. The external covering and pulp of the fruit are removed, and the nutmeg and mace are dried by exposure to the sun.

Nutmegs are round, of a greyish colour, streaked with brown lines, slightly unctuous; they have a strong aromatic flavour; and a pungent taste. They yield their active matter entirely to alcohol: distilled with water, they afford a fragrant and pungent essential oil; by expression, a sebaceous oil is obtained from them, retaining their fragrant odour, and part of their pungency, probably from the part of the essential oil being expressed along with it.

Nutmeg is used in medicine as a grateful aromatic. It may be given in a dose from 5 to 15 grains, and is sometimes employed to relieve nausea or vomiting, or to check diarrhœa, taken generally in wine. It has been said to prove narcotic in a large dose. It is also frequently employed to conceal the taste and flavour of unpleasant medicines, and to obviate the nausea they might excite.

Mace is a membranous substance, unctuous, of a yellow colour, and having a flavour and taste similar to nutmeg, but rather less strong. It is used for the same purposes.

The expressed oil of nutmeg, generally known by the name of Oil of Mace, is sometimes used as an external stimulating application, but in the shops is seldom genuine.

Offic. Prep.—Ol. Myrist. Mosch. Sp. Myrist. Mosch.—*Ed. Lond. Dub.*

Eugenia Caryophyllata. Caryophyllus Aromaticus. Clove. *Polyand. Monog. Hesperideæ. Flores cum pericarpio immaturo. India.*

The tree producing cloves is a native of the Molucca islands, but is cultivated in other parts of India The cloves are the expanded flowers, which are dried by exposing them first to the smoke of fuel, and afterwards to the sun. They are of a greyish-brown colour, slightly unctuous on the surface; have a strong aromatic odour, and a warm pungent taste. They afford to water their flavour principally; to alcohol their taste. By distillation with water, they yield a fragrant essential oil, not very pungent. The oil of cloves commonly met with is rendered acrid by a portion of the resinous extract obtained by the action of alcohol on cloves being dissolved in it.

Cloves are among the most stimulating of the aromatics. They are employed principally as adjuvants or corrigents to other medicines, particularly in combination with bitters, or with the vegetable cathartics. The essential oil is used with the same intention, and as a local application to severe toothach. The infusion in tepid water has been employed as a grateful stimulant to relieve the sense of coldness in the stomach, which attends some forms of dyspepsia.

Offic. Prep.—Infus. Caryoph *Lond.*

Capsicum Annuum. Capsicum. Guinea Pepper, or Capsicum. *Pentand. Monog. Solanaceæ. Fructus. East and West Indies.*

The fruit of this plant is an oblong pod of an orange colour, containing a pulp inclosing seeds. The membranous pod has an odour aromatic and penetrating, but which is impaired by drying; its taste is extremely hot and acrid, the sensation which it excites remaining long impressed on the

palate. Its pungency is completely extracted by alcohol, and partially by water.

Capsicum is a powerful stimulant. As such it has been given in a tonic gout, in palsy, and dyspepsia, in tympanitis and dropsy, and in the latter stage of fever, where the powers of life are nearly exhausted. It is given in the dose of 5 or 10 grains, in the form of pills. In chronic affections it is combined with preparations of iron or other tonics. It is used as a condiment to food, especially in warm climates, and proves useful by obviating flatulence and promoting digestion. An infusion of it in diluted vinegar, with the addition of salt, has been used as a gargle in cynanche; but the practice, though it has been successful in the West Indies, is not without danger, from the violent inflammation it is liable to induce. The capsicum pod is sometimes employed as an ingredient in rubefacient cataplasms, applied to the soles of the feet, to relieve the coma of fever. The seeds have been found useful in obstinate intermittents, two grains being given at the approach of the cold paroxysm.*

Offic. Prep.—Tinct. Capsici. *Lond. Dub.*

PIPER NIGRUM. Black Pepper. *Diand. Trigyn. Piperitæ. Fruct. India.*

BLACK or Common Culinary Pepper is the unripe fruit of this plant dried in the sun. Its smell is aromatic; its taste pungent. Both taste and smell are extracted by water, and partially by alcohol. The essential oil obtained by distillation has little or no pungency.

Pepper, from its stimulating and aromatic quality, is employed as a condiment to promote digestion: as a medicine it is given to relieve nausea, or check vomiting, to remove singultus, and as a stimulant in retrocedent gout and paralysis. Its dose is 10 to 15 grains. Its infusion has been used as a gargle in relaxation of the uvula.

White Pepper is the ripe berries of the same plant, freed from the outer covering, and dried in the sun. It is less pungent than the black.

PIPER LONGUM. Long Pepper. *Diand. Trigyn. Piperitæ. Fructus. East Indies.*

THIS is the berry of the plant, gathered before it is fully ripened, and dried in the sun. It is oblong, indented on the surface, of a dark grey colour. In flavour, taste, and other qualities, it is similar to the black pepper, and may be used for the same purposes.

PIPER CUBEBA. *Cubebs. Diand. Trigyn. Piperitæ. Fructus. East Indies.*

CUBEBS are the dried fruit of this tree. They have an aromatic odour, and a moderately warm taste. Their virtues are similar to those of the other peppers, and being rather weaker, they are little used. It has, however, lately been employed as a very powerful remedy in checking gonorrhœa, three or four drachms being taken in the course of the day, and continued for a day or two after the discharge has ceased.†

* *Incompatible Substances.* The infusions of capsicum are disturbed by infusions of galls, nitrate of silver, oxymuriate of mercury, acetate of lead, the sulphates of iron, copper, and zinc; ammonia, carbonate of potash and alum, but not by sulphuric, nitric, or muriatic acid. Paris. *Ed.*

† According to the analysis of M. Vauquelin, the cubebs contains 1. a volatile oil, which is nearly solid. 2. Resin, resembling that of the balsam copaiva. 3. A quantity

MYRTUS PIMENTA. Piper Jamaicensis. Jamaica Pepper. *Icosand. Monog. Hesperideæ. Baccæ. West Indies.*

THE berries of this tree are collected before they are ripe, and are dried in the sun. Their taste, though pungent, is less so than that of the peppers; their flavour is fragrant, and has been compared to that of a mixture of cloves, nutmeg, and cinnamon The flavour resides in an essential oil; the pungency in a resin Pimento is used in medicine as an aromatic, and principally on account of its flavour.

Offic. Prep.—Aq. Myrt. Pim. Ol. Vol. Myrt. Pim. Sp. Myrt. Pim. *Ed. Lond. Dub.*

AMOMUM ZEDOARIA. Zedoaria. Zedoary. *Monand. Monog. Scitamineæ. Radix. India.*

THIS root is in oblong pieces, of an ash colour; its smell is aromatic; its taste pungent and bitterish. It contains a portion of camphor, which is deposited from its essential oil.

Its virtues are merely those of an aromatic, and as it is rather weak, it is little used.

AMOMUM ZINGIBER. Zingiber Officinale. Ginger. *Monand. Monog. Scitamineæ. Radix. India.*

THIS plant has been placed under the genus Amomum, but the London College have admitted the alteration proposed by Mr Roscoe, and insert it as the species of a different genus, under the name of Zingiber Officinale. It is a native of India, but is now abundant in the West Indies, whence the dried root is imported. It is in wrinkled pieces, of a greyish or white colour, having an aromatic odour, and a pungent, somewhat acrid taste. The Black Ginger is the root prepared with less care than the White; the latter, previous to drying, being scraped and washed.

Ginger yields its aromatic matter to alcohol, and in a great measure to water. By distillation it affords a small quantity of essential oil, which is fragrant, but not pungent, the pungency residing in a resino-extractive principle.

This root is employed as a grateful and moderately strong aromatic, in combination with other remedies, to promote their efficacy or obviate symptoms arising from their operation, or by itself as a stimulant. With the latter intention, it is used in dyspepsia, flatulence, and tympanitis, either in the form of powder or infusion. Its dose may be 10 grains. Chewed, it excites the salivary discharge.

of another and coloured resin. 4. A coloured gummy matter. 5. An extractive principle, similar to that which is found in leguminous plants. 6. Some saline substances. With regard to the use of this article in gonorrhœa, I cannot say from my own experience, that I consider it in any respect superior to the Balsam Copaiva. I have used it in several cases and to a very great extent, and although in every case it sensibly diminished the discharge, yet in very few did it effect a permanent cure. In some instances, after administering the cubebs unsuccessfully, the disease has yielded very readily to the copaiva. By Dr. Trail of Liverpool, cubebs has been used with success in leucorrhœa. Dr. Paris states that the "Turkey yellow berries," the dried fruit of the Rhamnus Catharticus, are frequently substituted for cubebs, and that the resemblance between them is so great, as to render an imposition very easy. This is a fact which deserves to be generally known, and may perhaps account in part for the uncertainty which has hitherto been observed in the operation of the cubebs. *Ed.*

Offic. Prep.—Syrup. Amom. Zingib. Tinct. Amom. Zingib. *Ed. Lond. Dub.*

Amomum Repens. Amomum Cardamomum. Elettaria. Cardamomum. Cardamomum minus. Lesser Cardamom. *Monand. Monogyn. Scitamineæ. Semen. India.*

Two species had been described as affording the lesser cardamom seeds; the Amomum Repens, and Amomum Cardamomum. The Edinburgh College refer to the former; but from a more accurate description of the plant, it has been removed from the genus Amomum, and placed under a new genus, named Elettaria, the name chosen for the species being Elettaria Cardamomum. This has been admitted by the London College.

The seeds are dried, and imported by their capsules, by which their flavour is better preserved. Their smell is aromatic, their taste pungent, and both are communicated by infusion to water, as well as to alcohol. They afford by distillation an essential oil. They are used as grateful aromatics, and are frequently combined with bitters, or with purgatives, to obviate flatulence.

Offic Prep.—Tinct. Amom. R. *Ed. Lond. Dub.*—Tinct. Cardam. Comp. *Lond. Dub.*

Carum Carui. Caraway. *Pentand. Digyn. Umbellatæ. Semen. Indigenous.*

Caraway, though an indigenous plant, is usually cultivated for its seeds. They have an aromatic flavour, and a warm taste, depending principally on an essential oil, which they contain in considerable quantity. They are used to relieve flatulence, one or two drachms being swallowed entire; their essential oil, which has considerable pungency, and is grateful, is not unfrequently added to other medicines, to obviate nausea or griping.

Offic. Prep.—Sp. Car. Carv. *Ed. Lond. Dub.* Aq. Car. *Lond.* Ol. Car. *Lond. Dub.*

Coriandrum Sativum. Coriander. *Pentand. Digyn. Umbellatæ. Semen. South of Europe.*

This plant is cultivated in our gardens for its seeds. They have a more pleasant odour when dried than when fresh; their taste is moderately warm. Their taste and flavour depend on an essential oil Like caraway, they are used as carminative, and likewise to cover the taste and flavour of some medicines, particularly of senna, when given under the form of infusion or tincture.

Pimpinella Anisum. Anise. *Pentand. Digyn. Umbellatæ. Semen. Egypt.*

This plant is cultivated in the South of Europe, and sometimes also in our gardens. Its seeds have an aromatic odour, and a warm taste, with a share of sweetness. They afford, by distillation with water, an essential oil, having a strong rather unpleasant odour, and a sweet taste, without much pungency, and distinguished by the property of congealing at a very moderate degree of cold. They are used chiefly as a carminative in dyspepsia, and in the flatulence to which infants are subject. A small

quantity of the seeds may be taken, or, what is preferable, a powder composed of a few drops of the oil rubbed with sugar.

Offic. Prep.—Ol. Pimpin. Anis. *Ed. Lond. Dub.*—Sp. Anis. *Lond.*—Sp. Anis. C. *Dub.*

The seeds of the following plants have qualities so similar to those of anise or caraway, that they do not require distinct consideration. They are used for similar purposes, but are scarcely entitled to a place in the Materia Medica.

Anethum Fœniculum. Fœniculum dulce. Sweet Fennel. *Pentand. Digyn. Umbellatæ. Semen. Indigenous.*

Anethum Graveolens. Dill. *Pentand. Digyn. Umbellatæ. Semen. Spain and Portugal.*

Cuminum Cyminum. Cumin. *Pentand. Digyn. Umbellatæ. Semen. South of Europe.*

Angelica Archangelica. Angelica sativa. Garden Angelica. *Pentand. Digyn. Umbellatæ. Semen; Folia; Radix. North of Europe.*

Of this plant, the root possesses the greatest share of aromatic quality, though it also belongs to the seeds and leaves.

Mentha Piperita. Mentha Piperitis. Peppermint. *Didynam. Gymnosp. Verticillatæ. Herba. Indigenous.*

Of the different mints, this is one which has the greatest degree of pungency. The leaves have a considerable degree of aromatic odour and taste; the taste being pungent, followed by a sensation of coolness on the tongue. They afford an essential oil, rich in the aromatic quality and pungency of the herbs. Peppermint is used as a stimulant and carminative, to obviate nausea or griping, or to relieve the symptoms arising from flatulence, and very frequently to cover the taste and odour of other medicines.

It is used for these purposes under the forms of the watery infusion, the distilled water, the essential oil, and the lozenge prepared from the oil, or the essence as it is called, formed by dissolving it in alcohol.

Offic. Prep.—Aq. Menth. P. Ol. Menth. *Ed. Lond. Dub.*—Spirit. Menth. Piperit. *Ed. Lond.*

Mentha Viridis. Mentha sativa. Spearmint. *Didynam. Gymnosperm. Verticillatæ. Herba. Indigenous.*

Mentha Pulegium. Pennyroyal. *Didynam. Gymnosp. Verticillatæ. Herba. Indigenous.*

These two mints, spearmint and pennyroyal, resemble the peppermint in their qualities, and are used for the same purposes, but are less agreeable and pungent. Their essential oil and distilled water are inserted in the Pharmacopœia.

Hyssopus Officinalis. Hyssop. *Didynam. Gymnosp. Verticillatæ. Herba. Asia, South and East of Europe.*

This plant, which grows in our gardens, nearly allied to the preceding in botanical characters, is possessed of very similar qualities and virtues,

and is sometimes employed for the purposes for which they are used. It has also been considered as a remedy in catarrh, but it can have no efficacy.

[Eupatorium Perfoliatum. Bone-set. Thorough-wort. *Syngenesia Polygamia Equalis.* Nat. Ord. Lin. *Compositæ discoideæ. Herba et flores. America.*

This is a plant indigenous to our country, and has acquired very great and deserved celebrity as a remedy in various diseases. It is to be met with in every part of the United States, and flourishes in the vicinity of low and marshy situations. It is known by a variety of popular appellations, such as thorough-wort, thorough-wax, cross-wort, Indian sage, vegetable antimony, bone-set, &c. &c. In the neighbourhood of this city it flowers in the month of July

The whole plant is intensely bitter, and slightly astringent. The chemical composition of the Eupatorium has been investigated with much ability and success by Dr. Andrew Anderson of this city, and it results according to his analysis, that it contains first, a free acid; second, tannin; third, extractive matter; fourth, a gummy matter; fifth, a resin; sixth, azote; seventh, lime, probably the acetate of lime; eighth, a gallic acid, probably modified; ninth, a resiniform matter, soluble in water and in alcohol, and which seems to contain a bitter principle; that the free acid may be obtained from all parts of the plant; that tannin is obtained in much the largest quantity from the leaves, and least from the roots; that the extractive and gummy matter reside chiefly in the roots; that the leaves and flowers also contain a larger portion of resin than the roots: and that azote exists in the flowers, leaves, and roots.*

The active properties of Bone-set, are yielded both to alcohol and water.

With regard to the Medicinal virtues of this plant there has existed a great diversity of sentiment. If all that has been written on this subject could be credited, we should have to admit it to be one of the most extraordinary articles in the Materia Medica, for there is scarcely an indication to be encountered in the management of the diversified forms of disease which it has not been represented as equally capable of fulfilling. It has, accordingly, at different times and by different persons, been considered as a tonic, cathartic, emetic, diaphoretic, deobstruent, &c. &c. It is well known that the effects of a medicine are entirely different according to the dose and form in which it is given, and the peculiar circumstances of the patient at the time. If this fact be kept in view, there will be little difficulty in accounting for the great variety of virtues ascribed to the Bone-set, without calling in question the candour or veracity of the writers just alluded to. If given in substance or cold infusion, and in moderate doses, the bone-set exhibits all the properties of a vegetable tonic; while on the other hand, if taken warm and in large doses, it proves emetic, cathartic, diaphoretic, &c. There can be no question, however, that the efficacy of this plant is to be ascribed chiefly to its *tonic* and *diaphoretic powers*, and it is with this view that it has been principally used in the treatment of diseases.

A very large number of practitioners have given their testimony in favour of the success which has attended the use of this article in intermittent and remittent fevers. Dr. Anderson states that it was extensively used in the New-York Alms House in 1812, in the treatment of these dis-

* Inaugural Dissertation. New-York, 1813

cases, and that it proved generally successful. In yellow fever the virtues of the Eupatorium have been much commended by Drs. Bard and Hosack. It seems to have been used by these gentlemen chiefly as a diaphoretic. In the typhoid peripneumony, which prevailed so extensively in our country a few years since, the bone-set is stated to have proved an admirable sudorific, after the system had been properly prepared by previous evacuations. In this way it was very commonly prescribed by our physicians. In catarrh it has also for a long time been a favourite remedy in this country. As a simple tonic it has been highly recommended in diseases of general debility. The most efficacious preparation of it in this case is the alcoholic tincture. As an alterative, according to Dr. Barton, it has also proved highly beneficial in diseases of the skin.

The bone-set may be administered in powder, in decoction or infusion, and in tincture. When given as a tonic the dose of the powder is from 20 to 30 grains, and of the infusion from two to four ounces. When intended to act as a sudorific, the infusion must be given in larger quantities, and frequently repeated.—B.]

[Cornus Florida. Common Dogwood. New England Boxwood. *Tetrandria Monogynia.* Nat. Ord. *Stellatæ. Cortex.*

The Dogwood is a forest tree to be found in every part of our country, although it flourishes in the greatest abundance in the states of New-Jersey, Pennsylvania, Maryland, and Virginia. It is slow in its growth, and the general height to which it attains is from fifteen to twenty feet, with a diameter of from four to six inches. It flowers in the months of May and June. The berries succeeding to the flowers ripen in September, and are oblong in shape, and of a rich crimson colour. The bark is the part used in medicine, and according to the analysis of Dr. J. M. Walker, it contains tannin, gallic acid, resin, gum-resin, bitter extractive, and mucilage. (Inaugural Dissertation in Caldwell's collection of Medical Theses.) By Dr. Ives of this city the experiments of Dr. Walker have been repeated, and with confirmatory results. (Ives's Edition of Paris's Pharmacologia.) The medical properties of the Dogwood are those of a powerful tonic. In its operation on the system it bears a great resemblance to the Peruvian bark, and is used with great success as a substitute for that article in the management of the intermitting forms of fever. In the advanced stages of typhoid fevers, it has also been used with advantage. In dyspepsia, loss of appetite, and general debility, it has proved probably quite as successful as any of the stomachics and tonics in ordinary use. A circumstance of considerable importance in relation to the operation of this article is, that if administered in its fresh state, the bark is apt to disturb the stomach and bowels. By keeping it for about a year previous to use, this property will be completely corrected. The Dogwood may be administered in substance, in doses of from ℨj to ℨij; in extract, in doses of from 5 to 15 grains, or in infusion or decoction.

There are two other species of the Cornus which are used in medicine, the *cornus circinata* and *cornus sericea.* In their general properties, they so nearly resemble the C. Florida, as to render unnecessary any particular account of them. The Circinata has been made the subject of minute examination by Dr. Ives of this city*, and he states it to resemble the cin-

* Medical Repository, Vol. XXII.

chona cordifolia more than any other article, but that it differs from it in possessing more astringency and aroma. From its astringent properties it has been found very beneficial in debilitated conditions of the stomach and bowels. In chronic diarrhœa it is even recommended by some as surpassing in efficacy every other remedy. The doses in which it is to be administered are the same as those of the cornus florida. B.]

CHAP. VI.

OF ASTRINGENTS.

It has been supposed by medical theorists, that the fibres of the living body, over the whole, or in part of the system, may become relaxed, or lose that density and contraction necessary for the due performance of the several functions. And this is considered as an affection of the matter of which the fibre is composed, not of the living or irritable principle connected with it. It has farther been imagined, that this relaxation may be removed by the application of those substances, which, when applied to dead animal matter, condense and constringe it Such substances, classed as remedies, have been named Astringents. They are defined by Cullen: "Such substances as, applied to the human body, produce contraction and condensation in the soft solids, and thereby increase their density and cohesion." By the operation of this corrugating power, either directly exerted on a part, or extended by sympathetic action, the morbid affections arising from a state of relaxation are supposed to be removed.

The arguments adduced in support of these medicines exerting such a power, appear more conclusive than those brought in proof of any of the other explanations of the operations of medicines, founded on the mechanical physiology; hence they have generally commanded assent. Astringents, it is observed, exert this corrugating power on dead matter; they are serviceable as medicines in those affections which seem to depend on a relaxed state of the solids; they even corrugate the fibres of living matter, as is evident from the sensation they impress on the tongue and fauces; and applied to bleeding wounds, they restrain the flow of blood apparently by the same power.

We cannot, however, admit, without limitation, the supposition on which this hypothesis is founded,—that the affections which astringents obviate depend on mechanical laxity of the solids, and that these substances act solely by removing that laxity, by inducing a mechanical or chemical change. Debility was indeed once ascribed to such a cause; but with little reason; every degree of strength or weakness depends more on corresponding variations in the state of the powers peculiar to living matter; and substances capable of obviating disease dependant on any state of debility, must be such as are capable of acting on these powers. Many substances accordingly, arranged as Astringents, occasion considerable alterations in some of the functions: they produce effects which cannot be referred to their condensing power, allowing them to possess it; and, therefore, in all the changes they produce, part of their operation at least must be referred to actions which they exert, conformable to the laws of the living system.

For reasons of this kind, some have denied the existence of such a class of medicines as astringents. The substances which have received that appellation, they have considered as moderate stimulants, permanent in their action, and as differing little therefore from tonics.

It must be admitted, however, that there are substances which immediately restrain excessive evacuations; and that although between these and tonics there is in several respects a resemblance, in others they differ widely. The most powerful astringents, oak-bark for example, or galls, are much inferior in tonic power to other substances, having little or no astringency; while there are powerful tonics which do not produce the immediate effects of astringents.

There appears, therefore, to be a foundation for establishing such a class as astringents, though it is difficult to point out the precise nature of their operation. It must be admitted, perhaps, that astringents possess a power of corrugating or condensing the animal fibre. The sensation they excite in the mouth appears to be a sufficient proof of this, and it is farther established by chemical facts. That they likewise act as permanent stimulants, is proved by their power of removing intermittent fever, and other states of the system connected with debility. The one power may be conceived to modify the other; and to this modification or to their combined action, their effects may be ascribed.

Darwin advanced an hypothesis, that they act by producing absorption; this accounts for some of their effects, but not for others, particularly for their power of stopping hæmorrhage.

Astringents, from the powers they possess, are applied extensively to the treatment of diseases.

As stimulants, acting with considerable permanence, they may be substituted for tonics in diseases of debility. It has been found accordingly, that they have power to stop the paroxysm of an intermittent fever, when given a short time before its accession; and in cases of debility, they seem to be often of utility, independent of their power of checking debilitating evacuations.

It is, however, for restraining increased evacuations that astringents are usually employed. Hæmorrhage, where it does not arise from a solution of continuity, depends on the force of contraction in the extreme arterial branches not being sufficient to resist the impulse of blood from the larger branches,—a deficiency of contraction generally owing to a debilitated state of these vessels. Astringents, as stimulants, slow and permanent in their action, and not sensibly increasing the force of the circulation, are calculated to obviate such a state: and this may be farther promoted by their corrugating power, which may be extended from the stomach by sympathetic action to the vascular fibre; somewhat in the same manner that the constringing effect of cold suddenly applied is extended from the surface of the body. Hence their use in menorrhagia, hæmoptysis, and other discharges of blood; though they likewise frequently fail, from their operation being too slow and feeble to resist the impetus of the circulation, or counteract the flow from a ruptured vessel. In epistaxis, or bleeding wounds, they are more powerful, as they can be more directly applied to the part.

By an operation probably similar, astringents check serous effusions; hence their use to retain colliquative sweats. In diarrhœa too, they appear to operate by checking the effusion of fluid from the exhalent vessels of the intestines, and thus diminishing the increased stimulant opera-

tion, which from this cause is exerted on the moving fibres of the canal, and increases its peristaltic motion. In the latter stage of dysentery, where an increased evacuation appears to be connected with debility of the exhalent vessels, their cautious administration is advantageous. And in passive inflammation, attended with increased serous discharge, as in gleet, and in some forms of ophthalmia, the topical application of astringents affords the most successful mode of treatment.

In the administration of astringents, it is an obvious caution, that they ought not to be applied to check evacuations where these are critical, or where they are necessary to relieve a plethoric state of the vessels, or a state of increased action; at least unless the evacuation proceed to an alarming extent.

Some narcotics, as opium, produce effects apparently astringent. When increased discharges take place from irritation, these remedies, by diminishing irritability, lessen the discharge; they are thus serviceable both in hæmorrhage, and in diarrhœa arising from that cause. But their mode of operation is obviously different from that of astringents; and in the cases in which they are of benefit, the latter would be useful, and only by an indirect operation.

Astringents may be subdivided into those belonging to the mineral, and those belonging to the vegetable kingdoms, which differ considerably from each other in their chemical properties, and probably therefore in the mode in which they produce their astringent effect. All the vegetable astringents of any considerable power contain tannin, and hence it has been considered, perhaps with justice, as the principle in which their astringency resides. Whether they produce their astringent effect by the tannin combining chemically with the animal fibre, as their corrugating effect in dead animals is produced, cannot be determined. We can scarcely conceive of any other mode of operation, yet any change of this kind, if it did take place, might be expected to be more permanent, and productive of more important effects than it actually is.

ASTRINGENTS.

FROM THE MINERAL KINGDOM.

Acidum Sulphuricum.	Ferrum.
Alumina.	Zincum.
Super-Sulphas Aluminæ et Potassæ.	Cuprum.
Calx.	Plumbum.

FROM THE VEGETABLE KINGDOM.

Quercus Robur.	Rosa Gallica.
Quercus Cerris.	Arbutus Uva Ursi.
Tormentilla Erecta.	Acacia Catechu.
Polygonum Bistorta.	Kino.
Anchusa Tinctoria.	Pterocarpus Draco.
Hæmatoxylon Campechianum.	Pistacia Lentiscus.

OF ASTRINGENTS FROM THE MINERAL KINGDOM.

Acidum Sulphuricum. Sulphuric Acid. Acidum Vitriolicum. Vitriolic Acid.

Sulphur combines with oxygen in different proportions : when united with the largest proportion, it forms an acid extremely powerful from its state of concentration, the Sulphuric Acid. This acid used to be obtained from the decomposition of sulphate of iron, the Green Vitriol of commerce, by heat, and hence the name of Vitriolic Acid which was given to it. It is now formed by the combustion of sulphur. The sulphur, reduced to powder, is mixed with from one-eighth to one-tenth of its weight of nitrate of potash ; the mixture, in small quantities, is kindled upon a hollow stone, placed within a large leaden chamber, the bottom of which contains water to the depth of two inches, and which is closed, or only occasionally opened to admit the renewal of the atmospheric air. The combustion of the sulphur is supported partly by the oxygen of the nitre, partly by that of the air which is admitted ; the sulphuric acid produced is absorbed by the water in the bottom of the chamber ; and when the liquor has arrived at a certain degree of impregnation, it is withdrawn, and concentrated first by evaporation from leaden troughs, and afterwards by boiling in glass retorts. The use of the nitre in this mode of conducting the process is indispensible ; it was supposed to operate simply by affording oxygen to the sulphur, and thus enabling the combustion to proceed at a lower temperature, and with a less free exposure to the atmospheric air. The theory of its action, however, appears, from the view of it given by Clement and Desormes, to be more complicated. The product of the combustion of the sulphur is principally sulphurous acid, which can scarcely be condensed. But by the partial abstraction of the oxygen of the nitric acid of the nitre during the combustion, nitric oxide gas is evolved ; this diffused through the chamber combines with the oxygen of the atmospheric air, and forms nitrous acid vapour, which re-acts on the sulphurous acid, communicates to it oxygen, and converts it into sulphuric acid.

Sulphuric acid, prepared by this process, is of the specific gravity of 1.850, and at this degree of concentration has been estimated to contain 21 of water in 100 parts ; the real acid is composed of 42 of sulphur, and 58 of oxygen ; but it cannot be obtained insulated without the presence of water, and hence the common acid is properly hydro-sulphuric acid, In its usual state of concentration, it is of a thick consistence, and has an apparent unctuosity ; it is colourless and transparent ; is highly corrosive, and possesses all the general acid properties in an eminent degree. As obtained by this process, it is not perfectly pure, but contains a little sulphate of potash, and sometimes a little sulphate of lead. The quantities of these, however, especially of the latter, are very inconsiderable ; they are in a great neasure separated when the acid is diluted, and hence this dilution not only renders it more convenient for administration, but likewise more pure.

Sulphuric acid has a very strong attraction to water, so as to imbibe it rapidly from the atmosphere ; and hence the necessity of its being kept in bottles well stopt. It is also liable to acquire a brown colour from the contact of the smallest quantity of vegetable matter.

As a medicine, this acid is employed as a refrigerant, but principally as an astringent, and in this property it is undoubtedly superior to any other

acid. It is used as an astringent to check the flow of blood in hæmoptysis and the colliquative sweat in hectic fever; indications which it fulfils better than any other article in the Materia Medica. It is sometimes also used in menorrhagia and diabetes; and as a tonic, founded on its astringent property, in dyspepsia In its concentrated state. its dose can scarcely be measured. In the Pharmacopœias, it is therefore ordered to be diluted. According to the formula given by the Dublin and Edinburgh Colleges, the Acidum Sulphuricum Dilutum consists of one part of the strong acid with seven of water; it is given in a dose from 10 to 30 drops. According to that of the London College, it consists of one part and a half of acid, to 14 parts and a half of water. The Acidum Sulphuricum Aromaticum consists of the acid diluted with alcohol impregnated with aromatics, and is given in a similar dose. From its astringency, this acid is added to gargles, which are employed to check salivation, or relieve relaxation of the uvula. Externally mixed with lard, in the proportion of half a drachm to an ounce, it has been used with advantage in psora, and it has also been given internally in the same disease.

Offic. Prep.—Acid. Sulph. Dil. *Ed. Lond. Dub.*—Acid. Sulph. Aromat. *Ed.*

Argilla. Alumina. Argil. Alumine.

This earth, in its pure form, is insipid and inert; but in its saline combinations, at least all of them which, from their solubility, are sufficiently active, there exists a greater or less degree of astringent power. The Boles, of which the Armenian Bole (Bolus Armena) is the chief, are argillaceous earth, impregnated with oxide of iron; they were at one time employed as astringents, but are entirely inert, and are now expunged from practice.

Alumen. Super-sulphas Aluminæ et Potassæ. Alum.

This salt is composed chiefly of argillaceous earth and sulphuric acid, the acid being in excess. It likewise always contains, however, a portion of potash, which is essential even to its constitution, and in some of the forms of it met with in commerce, a small quantity of ammonia. It is found native, efflorescing generally in the interstices of what is named alum slate; or it is prepared from what are named alum ores, which consist essentially of clay impregnated with sulphur, or sulphuret of iron. The ore being calcined is exposed to atmospheric air; the sulphur absorbing oxygen, forms sulphuric acid, which unites with the argillaceous earth of the clay, with a portion of potash which the ore often contains; or if this alkali is not present in sufficient quantity, carbonate or sulphate of potash, or sometimes even muriate of potash, is added to afford it: sometimes too a portion of impure ammonia, obtained by distilling urine or bones, is employed. The liquor is concentrated by boiling, so as to yield, on cooling, the alum in a solid state, of a crystalline structure, though of no regular form.

This salt is in large masses, transparent, colourless, and vitreous in appearance: it has a styptic taste, with a degee of sweetness. From the excess of its acid it reddens the vegetable colours. It is soluble in eighteen parts of cold, and in less than two of boiling water. The variety termed Roche or Rock Alum (Alumen Rupeum) is in similar fragments, efflorescent on the surface, and of a reddish colour. Common alum consists of 26 of acid, 12.8 of argil, 10 of potash, and 51.5 of water. This water

of crystallization causes it to liquify when exposed to moderate heat; when it is expelled by the continuance of the heat, a white spongy mass remains, named Calcined or Dried Alum.

Alum, from its astringent power, is employed to check hæmorrhages and serous evacuations; it is thus given in menorrhagia, leucorrhœa, and diabetes; and in leucorrhœa, is perhaps more successful than any other astringent. It has likewise been used, though less frequently, in intermittent fever, and in colica pictonum. Its dose is from 5 to 10 grains. The addition of an aromatic is generally necessary, to prevent it from exciting nausea, when it is given in the solid form; but the best form of administering it, is that of Alum Whey (SerumAluminosum), prepared by adding two drachms of pounded alum to a pint of hot milk; the dose of this is 3 or 4 ounces. Externally alum is frequently used as the basis of astringent gargles, and of injections used in gleet; and dissolved with sulphate of zinc or copper, it forms very styptic solutions, employed to check hæmorrhage by direct application.*

Offic. Prep.—Alum. Exs. Pulv. Sulp. Alum. C. *Ed.*—Liq. Alum. C. *Lond.*

Calx. Lime. Calx Viva. Quicklime. (Page 129).

This earth is found abundantly in nature, in several states of combination. It is usually obtained by exposing any of its native compounds with carbonic acid,—chalk, limestone, or marble, to a heat gradually raised to a degree of intensity sufficient to expel the acid: the lime remains more or less pure. It is soluble in water, in sparing quantity; about 700 parts being required for its solution. Yet even in this weak state of impregnation, the solution, which is known by the name of Lime Water (Aqua Calcis), prepared by agitating water with slacked calcined lime, has a strong styptic taste, and is capable of exerting important chemical agencies, as well as of acting on the living system. As an astringent, lime water is employed in diabetes, and in diarrhœa: the dose is one or two pounds in the course of the day. It is used likewise in dyspepsia, in which it proves useful, more by its tonic and astringent power, than by its effect in neutralizing acid in the stomach. Externally it is applied as a wash to ill-conditional ulcers.

Offic. Prep.—Aqua Calc. *Ed. Lond. Dub.*—Aqua Calcis Composit. *Dub.*—Linim. Aquæ Calcis. *Ed. Dub.*

Carbonas Calcis. Carbonate of Lime.

The various kinds of carbonate of lime, Chalk (Creta Alba), Crabs Claws (Chelæ Cancrorum), Oyster Shells (Testæ Ostreorum), are not unfrequently used in diarrhœa, but they evidently prove useful, not by any real astringent power, but by correcting the acidity which so frequently occasions or aggravates that disease. They rather belong, therefore, to the class of Antacids.

Ferrum. Iron. (Page 117.)

This metal has been already considered as a tonic; it is likewise employed as an astringent to check increased evacuations. It is thus used

* *Incompatible Substances.* Alkalies and alkaline salts, carbonate and muriate of ammonia, carbonate of magnesia, tartrate of potash, lime water, super-acetate of lead, the salts of mercury, as well as many vegetable and animal substances, especially galls and kino. Paris. *Ed.*

with advantage in some forms of passive hæmorrhage, particularly menorrhagia. The advantages derived from it in such cases may be supposed to depend on its tonic power; the styptic taste, however, of its saline preparations, is a sufficient proof of the presence of astringency to a certain extent; and it is not improbable that this may coincide with, or modify the operation connected with its action as a tonic. The sulphate and the muriate of iron are the preparations in which the astringent property is most obvious.

Zincum. Zinc. (Page 121.)

This metal has likewise been considered as a tonic. Its saline preparations have, however, a considerable degree of astringency; and there are several medicinal applications of them founded on this quality.

Sulphate of Zinc (Sulphas Zinci) has been employed internally as an astringent in chronic dysentery, and in the treatment of intermittent fever; but from its emetic power, its operation is liable to be harsh, and is not easily regulated. Its solution is in common use as an injection in gonorrhœa when the inflammatory state has subsided, and in gleet, two grains being dissolved in an ounce of water; and it frequently succeeds in checking the discharge, apparently from its astringent power. A solution of nearly the same strength is used as a collyrium in ophthalmia; the astringent power of this being increased, according to a formula in the Edinburgh Pharmacopœia, by the addition of a few drops of diluted sulphuric acid. Dissolved with alum, it forms a very styptic liquor which is an officinal preparation, and has long been in use for stopping hæmorrhage, and checking increased discharges, by external application.

Acetate of Zinc, under the form of solution (Solutio Acetatis Zinci), is obtained by adding a solution of acetate of lead to a solution of sulphate of zinc, a mutual decomposition taking place, and sulphate of lead being precipitated, while acetate of zinc remains dissolved. This has been in use as a mild astringent injection in gonorrhœa, less liable to produce irritation, or to check the discharge suddenly, than the solution of sulphate of zinc, and rather more active than the solution of acetate of lead. It has therefore received a place in the Edinburgh Pharmacopœia. A solution of the salt in alcohol has been introduced into the Dublin Pharmacopœia, and is used largely diluted with water.

Cuprum. Copper. (Page 122.)

Copper has so far an analogy to the preceding metals, that along with the general action which it exerts on the system, capable of obviating spasmodic affections, it has a degree of astringent power. This too is conspicuous, principally in its combination with sulphuric acid, the sulphate of copper. This salt in solution, is sometimes used externally as an astringent; and dissolved with alum in water, to which a portion of sulphuric acid is added, it forms a very styptic solution, formerly named Aqua Styptica, sometimes employed by direct application to restrain hæmorrhage. The formula has a place in the Edinburgh Pharmacopœia.

Offic. Prep.—Sol. Sulph. Cupr. Comp. *Ed.*

Plumbum. Lead.

This metal, when rendered capable of acting on the system by oxidation, or combination with acids, produces very deleterious effects, and proves a powerful, though insidious poison. Nor is it easy to explain its

mode of action. It appears to act peculiarly on the muscular fibre, repressing action, and at length exhausting the irritability of the muscles. When introduced slowly into the system, the intestines are first affected, constipation from diminished action takes place, accompanied frequently with severe pain. Tremor and debility of the voluntary muscles succeed, and are followed by paralysis, the muscles losing their firmness and cohesion. When a large quantity of any of the active preparations of lead is received into the stomach, these symptoms occur suddenly and with violence, giving rise to the disease named Colica Pictonum, which is also sometimes suddenly induced by the progressive accumulation of the metal in smaller quantities. A sense of constriction is felt in the stomach and bowels, with obstinate constipation and the most severe pain: the pulse is small and hard; respiration becomes laborious; there is general muscular debility and tremor, accompanied with cold sweats and convulsions, which have often a fatal termination.

From Dr. Campbell's experiments, (Inaugural Dissertation), it appears, that lead, applied to a wound, is less active than the other mineral poisons. A saturated solution of acetate of lead, applied in small quantity, did not produce any deleterious effect; two drachms of the salt itself applied to a wound in the neck of a dog, occasioned little immediate injury. Still the kind of action appears to be nearly the same, though more slowly induced. In the latter experiment, after a number of days, the power of motion in the limbs was impaired, the pulse became small and quick, the respiration difficult, the belly was swelled. and on the twenty-third day the animal died: on dissection, the internal surface of the stomach appeared inflamed, and part of the intestinal canal was slightly inflamed, with into-susception. In the production of these local effects, lead is analogous to other metallic poisons; and they farther display its peculiar determination to the intestines.

From the external application of lead, its usual deleterious effects have been stated to be produced, and numerous cases have been adduced in support of this. Infants have been observed to be affected with convulsions from the too free application of cerusse to the skin; and even in adults, pain in the abdomen, spasms of the muscles, and paralysis, have been induced from the application of saturnine solutions or cataplasms. Other facts again have been stated in opposition to these, proving, that from the most free external application of the preparations of lead, no injurious consequences whatever arise; and this appears to be confirmed by the freedom with which they are employed in common practice. The comparative inactivity, too, of the preparations of this metal, when applied even to a wound, would lead to the conclusion, that from mere application to the skin, they can have little effect. Yet, as deleterious effects do result from the former mode of application, it is possible they may also from the latter, in irritable or susceptible habits: and the facts stated in proof of this, seem to rest on evidence which cannot well be denied. The explanation of this is probably to be found in the influence of idiosyncracy, which with regard to the action of lead, exists to a very considerable extent, some individuals being much more susceptible of its action than others, as has been remarked in cases where it has been taken internally to nearly the same extent, from the use of articles of food or drink which have received an impregnation of the metal,—some suffering severely, while others have sustained much less apparent injury.

From its power of repressing muscular action, lead produces effects analogous in some respects to those of astringents, and it is usually ranked as an astringent, though its mode of operation is probably dissimilar.

The preparations of lead which have been applied to medicinal use, are the semi-vitrified oxide, the white oxide or sub-carbonate, and the acetate and super-acetate.

Oxidum Plumbi Semi-Vitreum. Lithargyrum. Litharge. This substance is usually obtained in the calcination to which lead is submitted, with the view of separating the silver frequently associated with it; the flame, with a current of air, being made to reverberate on the surface of the melted metal. It is in flakes of a yellow colour, with a vitreous lustre. A small quantity of carbonic acid, not exceeding 4 parts in 100, exists in it, apparently not essential to its constitution. It is used only in some pharmaceutical preparations, particularly for forming, when boiled with oil, a plaster which serves as the basis of other compound plasters, and which is sometimes applied as a healing dressing to wounds.

Offic. Prep.—Emp. Oxid. Plumb. *Ed. Lond. Dub.*

Oxidum Plumbi Rubrum. Minium. Red Lead.—This is an oxide containing about 12 of oxygen in 100 parts. It is prepared by calcining lead with a fire gradually raised, stirring the oxide constantly, to expose it better to the action of the air. It is sometimes applied to the same purposes as litharge, and an ointment formerly in use as a cooling application was prepared by rubbing it with vinegar and oil. It might be discarded, however, from the Pharmacopœia.

Carbonas Plumbi. Sub-Carbonas Plumbi Cerussa. Cerusse, or White Lead.—This is prepared by inclosing plates of lead with vinegar in earthen vessels, which are exposed to a gentle heat, so as to convert the vinegar into vapour; it acts chemically on the lead plates; and a white crust is formed on their surface, which, when it has accumulated, is scraped off, and reduced to a fine powder by levigation. The nature of this substance has not been very well ascertained. It has been regarded as an oxide. A little carbonic acid being generally contained in it, either absorbed from the atmosphere, or formed by the partial decomposition of the acetic acid, it has been considered as a sub-carbonate; and the London College have defined and named it as such. From theory, it might be inferred to contain a portion of the acetic acid by which it is formed; the Dublin College have accordingly named it Sub-Acetas Plumbi. It is used only externally, being applied in fine powder to slight cases of excoriation or inflammation, and used particularly to relieve these affections in children, —a practice, however, which, from some observation, appears not to be without danger, and which is unnecessary, as the levigated calamine stone answers equally well. It is used likewise as the basis of an ointment, which is sometimes applied as a cooling dressing to inflamed parts.

Offic. Prep.—Ungt. Carbon. Plumbi. *Ed. Dub.*

Acetas et Super-Acetas Plumbi. Acetate and Super-Acetate of Lead. —There are two compounds of lead with acetic acid, medicinally employed. One is the salt, which has been long known by the name of Sugar of Lead, (Saccharum Saturni;) the other a solution, which was named Goulard's Extract of Lead.

The first of these had been regarded as the proper acetate of lead. Thenard found, that it is the super-acetate, or contains an excess of acid, which is necessary to give it its usual crystalline form, which is that of a slender four or six-sided prism. When its solution is boiled with a little ox-

ide of lead, the neutral acetate is formed, which crystallizes in plates. Goulard's Extract, which is prepared by boiling vinegar on litharge, Dr. Bostock found to be a solution of the neutral acetate.

Super-Acetas Plumbi. Super-Acetate of Lead.*—This is the Saccharum Saturni; it is still named Acetate of Lead (Acetas Plumbi) in the Edinburgh Pharmacopœia. The process for preparing it consists in boiling distilled vinegar on cerusse, until the acid acquire a sweet taste, and evaporating the liquid, so that, on cooling, it affords crystals: it is usually prepared on a large scale. It is in masses composed of slender prismatic crystals, aggregated, of a yellowish colour, slightly efflorescent: it has a very sweet and styptic taste, is abundantly soluble in water, but scarcely forms a transparent solution even with distilled water, owing to a slight decomposition, in consequence of which a little sub-acetate is precipitated. It consists, according to Thenard's analysis, of 58 of oxide, 26 of acid, and 16 of water. The excess of acid in it is very inconsiderable.

The medicinal use of this salt is nearly limited to its external application. Yet some practitioners have recommended it in cases of profuse evacuation, particularly in hæmorrhage, where other remedies have failed: it has thus been given in menorrhagia, in the dose of half a grain repeated every four hours: it has likewise been employed in obstinate leucorrhœa, and to restrain the colliquative sweat accompanying hectic fever. From the deleterious agency, however, of lead on the system, it is a remedy which must be used with reluctance, and which is accordingly scarcely ventured on in modern practice. There is one circumstance, too, that renders its administration more difficult,—its being liable to be considerably influenced by idiosyncracy; many facts having sufficiently established that the action of lead is extremely unequal, quantities of it having been often taken without any injurious effect, which, in other cases, would have proved in the highest degree deleterious. It would not be easy, therefore, to regulate its dose so as to obtain its beneficial, without the hazard of its injurious effects.

As an external application, Sugar of Lead, as it is named, is often employed to obtain its astringent effect. A solution of it, of the strength of three grains to an ounce of water, is used as an injection in gonorrhœa; and producing no irritation, is not liable to be attended with the injurious consequences which sometimes arise from preparations more active. A solution rather weaker is employed as a collyrium in ophthalmia, and can be applied with safety, even in the state of active inflammation. A stronger solution is a common application in superficial inflammation; and an ointment, of which it is the basis, is employed as a dressing to inflamed or excoriated parts. Its saturated solution, combined with vinegar, is frequently employed as a discutient. Facts have been brought forward which apparently prove, that the general effects of lead on the system have been produced by the incautious or too long continued use of these external applications; while, in many cases, they have unquestionably been extensively employed without the production of any bad effect, and indeed are so in common practice; a discordance which, as has been already stated, is probably to be accounted for from the peculiar idiosyncracy with regard to the action of lead on the system, in consequence of which some individuals are more liable to be affected by it than others.

* *Incompatible Substances.* The alkalies, alkaline earths and their carbonates, most of the acids, alum, borax, the sulphates and muriates, soaps, all sulphurets, ammoniated and tartarized iron, tartarized antimony, undistilled water. Paris. *Ed.*

The neutral acetate of lead forms the basis of what has been named Goulard's Extract,—a preparation which has long been in use among surgeons. It is named Liquor Plumbi Sub-acetatis; and is prepared by boiling vinegar on litharge. Although it differs in chemical composition from the preceding preparation, it does not appear to differ from it in medicinal powers. It is used diluted with water, as a lotion in cutaneous diseases, or as an application to inflamed surfaces. In the original formula for the preparation of this lotion given by Goulard, a little ardent spirit was added to it, and this being in common use, has been received as an officinal preparation by the London and Dublin Colleges.

Offic. Prep.—Ungt. Acet. Plumb. *Ed. Lond. Dub.*—Liq. Plumb. Subacet. Dilut. *Lond. Dub.*—Cerat. Plumb. Composit. *Lond.*—Unguent. Carbonat. Plumb. *Ed.*

OF VEGETABLE ASTRINGENTS.

THE property of astringency in vegetables, denoted by its effect of corrugating the animal fibre, appears to be dependent on a common chemical principle, or at least to be connected with some peculiarity of composition; since vegetable astringents uniformly possess certain common chemical properties. Thus, their astringency is extracted both by water and by alcohol; these infusions strike a purple or black colour with the salts of iron, deeper in general as the astringent is more powerful; and they are capable of corrugating, more or less strongly, dead animal matter, as is shewn in their operation in the process of tanning.

In the farther investigation of this subject, it was found, that a peculiar acid exists in the more powerful astringents; the acid which, from being contained abundantly in galls, has been named Gallic, and the general chemical characters of which, in the preliminary sketch on the principles of Pharmaceutic Chemistry, have been enumerated. This acid having the property of striking a purple colour with the salts of iron,—the chemical change which had been more particularly considered as the test of astringency, it was supposed to be the astringent principle.

To this, however, there existed a very obvious objection, that the acid, when obtained insulated, is possessed of no great astringency, and scarcely indeed of that property in any sensible degree; and farther, that the colour it strikes with the salts of iron is less deep than that from the infusions of the more powerful astringents.

The researches of Seguin threw more light on this subject, by the discovery of a different principle existing in astringents, having a better claim to be ranked as the principle of astringency. Applying the proper test to discover it, that of the animal matter on which it peculiarly operates, he found, that on adding a solution of animal gelatin to the infusion of a vegetable astringent, as that of galls or oak bark, a precipitation takes place, arising from the combination of this principle with the gelatin. Being the agent which gives to astringents their property of tanning, it has received the name of Tannin, and its properties, as a principle of vegetables, have been already stated.

That it is the principle of astringency in vegetables, admits of little doubt. Gallic acid has no such power, while tannin has a harsh styptic taste, and the power of corrugating the animal fibre. Seguin had supposed, that in

the operation of tanning, its action is facilitated by that of the gallic acid, the acid partially de-oxidating the skin, and bringing it nearer to the state of gelatin, with which the tannin combines. A similar action might be supposed to be exerted on the animal fibre to the production of the astringent effect. The theory of Seguin, however, was not established, and the fact that some of the strongest astringents, as catechu or kino, contain no gallic acid, but tannin only mixed with mucilage or extract, is a proof that it is to the action of this principle that the effect is to be ascribed.

If astringency, as exerted by vegetables, is thus to be considered as the result of the chemical action of the principle on which it depends, there is considerable difficulty, as has been already remarked first, in conceiving how it can be produced in the part to which the astringent is applied, and, secondly, in conceiving how it can be exerted in the animal system, especially in a distant part, when the astringent acts only on the stomach It can only be supposed, that corrugation, or some similar change, is produced by it in the fibres of the stomach, which may be propagated by sympathy to distant parts, nearly in the same way as the impression of cold is communicated. But the supposition that the corrugation is the effect of any combination of the tannin with the animal fibre, it is rather difficult to admit.

Quercus Robur. Oak. *Monoec. Polyana. Amentaceæ Cortex. Indigenous.*

The bark of this tree possesses a large share of astringency, which it yields to water. The infusion contains both gallic acid and tannin, the latter in considerable quantity, attached to the ligneous fibre, which forms the basis of the bark. An ounce of bark afforded, in Davy's experiments on astringents, 111 grains of solid matter by lixiviation, of which 77 were tannin; but the quantity varies much according to the season and the age of the tree.

Oak bark has been used as a remedy in hæmorrhage, diarrhœa, and intermittent fever, given in a dose from 15 to 30 grains. In modern practice, its strong infusion or decoction is occasionally employed as an astringent gargle in cynanche, as an injection in leucorrhœa and profuse menorrhagia, and as a fomentation in hæmorrhoids and prolapsus ani.

Offic. Prep.—Decoct. Quercus. *Ed. Lond.*—Extr. Cort. Querc. *Dub.*

Quercus Cerris. *Monoec. Polyand Amentaceæ. Cyniphis nidus. Galla. Galls. Asia Minor. South of Europe.*

The tubercles named Galls, are found on the branches of this tree; their production is occasioned by the bark being pierced by an insect of the cynips genus, to deposit its egg. The juice exuding slow, is inspissated and hardens. The best galls are heavy, knotted on the surface, and of a blue colour. They are nearly entirely soluble in water, with the assistance of heat; the infusion reddens the vegetable colours from the action of the gallic acid, and this acid can be procured in considerable quantity, by allowing the infusion to remain exposed to the air until its other principles are decomposed; or it is at once obtained by sublimation from the galls. The infusion too, contains a large quantity of tannin, as it gives a very copious precipitate with solution of gelatin. It has farther been supposed to hold dissolved extract and mucilage; but the existence of extract is doubtful, and from Dr. Bostock's experiments there appears to be no sensible portion of mucilage. The proportion of tannin varies considera-

bly in different specimens of galls. In Davy's analysis of Aleppo galls, 500 grains afforded to water by lixiviation 185 grains of solid matter, of which 130 were tannin, 31 gallic acid, 12 saline and earthy matter, and 12 supposed to be mucilaginous and extractive matter.

In medical practice, galls, though powerfully astringent, are seldom internally administered. The strong infusion or decoction has been applied to the same purposes as the decoction of oak bark. And an ointment composed of the galls in fine powder, with eight parts of simple ointment, is used as an astringent application to hæmorrhoidal affection.*

Offic. Prep.—Tinct. Gallar. *Ed. Dub.*

TORMENTILLA ERECTA. Tormentil. *Icosand. Polygn. Senticosæ. Radix. Indigenous.*

THE root of tormentil, which is small and knotted, is strongly astringent, with little flavour or bitterness; and though it has not been chemically examined, it probably owes its astringency to tannin. It has been used in diarrhœa under the form of decoction, and in intermittent fever in substance, in the dose of from half a drachm to a drachm. But it is now nearly discarded from practice.†

POLYGONUM BISTORTA. Bistort. *Octand. Trigyn. Oleraceæ. Radix. Indigenous.*

THE root of this plant is a pure and very strong astringent: as such it has been used in diarrhœa and in intermittent fever, in a dose from a scruple to a drachm. But having propably no superiority over other astringents, and no peculiar virtue, it has fallen into disuse.

ANCHUSA TINCTORIA. *Alkanet. Pentand. Monogyn. Asperifoliæ. Radix. South of Europe.*

THE cortical part of the root of this plant has a deep red colour. which has the singular property of not being extracted by water, but readily by expressed oils. Its watery infusion, however, strikes a dark colour with sulphate of iron, probably from the presence of tannin; and it possesses a slight degree of astringency; it is only employed to communicate colour to ointments.

HÆMATOXYLON CAMPECHIANUM. Lignum Campechense. Logwood. *Decand. Monog. Lomentaceæ. Lignum. South America.*

THE wood of this tree is of a deep red colour; it has scarcely any smell; its taste is sweetish and astringent. Its active matter is extracted by water and by alcohol, leaving the ligneous fibre undissolved; both solutions strike a deep purple colour with the salts of iron, and give a precipitate with gelatin. Logwood has been employed as an astringent in diarrhœa and chronic dysentery, under the form of the decoction, or the watery extract. The extract has been proposed to be used as a substitute for kino.‡

* *Incompatible Substances.* Metallic salts, especially those of iron, produce precipitates with infusion of galls, composed of tannin, gallic acid, and the metallic oxide. Sulphuric, muriatic, and nitric acids, the carbonates of the alkalies and lime-water. Paris. *Ed.*

† *Incompatible Substances.* Solutions of isinglass, the salts of iron, alkalies and alkaline earths. Paris. *Ed.*

‡ *Incompatible Substances.* Acetate of lead, alum, the sulphates of copper and iron, tartarized antimony, sulphuric, muriatic, and acetic acids. Paris. *Ed.*

Offic. Prep.—Extr. Hæmatoxyl. Camp. *Ed. Dub. Lond.*

Rosa Gallica. Rosa Rubra. Red Rose. *Icosand. Polyg. Senticosæ. Petala. South of Europe.*

The petals of this species of rose have a slight degree of astringency, which is most considerable before they are expanded, and it is in this state that they are collected and dried for use. The fresh leaves of the flowers are made into a conserve with sugar, which was at one time regarded as a remedy of some power in hæmoptysis and phthisis, but which has long been acknowledged to be inert. The infusion of the dried leaves, acidulated by the addition of sulpuric acid, forms a pleasant astringent gargle.

Offic. Prep.—Inf. Ros. Gal.—Cons. Ros. R.—Syr. Rosæ.—Mel. Rosæ.—*Ed. Lond. Dub.*

The petals of the Rosa Centifolia have no astringency, but are slightly laxative, and are employed from this quality in the preparation of a syrup, which is sometimes given to infants as a laxative. Their distilled water is recommended as a vehicle by its grateful flavour.

Arbutus Uva Ursi. Bear's Whortle-Berry. *Decand. Monog. Bicornes. Folia. Europe, America.*

This shrubby plant is a native of this, as well as some of the other countries of Europe, and grows on our mountains. Its leaves, which are small, and of a dark green colour, have a bitter astringent taste, without any odour. Their watery infusion strikes a deep black colour with the salts of iron, and from their known astringency, which adapts them even to the purpose of tanning, they probably contain a large proportion of tannin.

From its astringency, uva ursi has been employed in menorrhagia and other fluxes. It has however been used more particularly in cystirrhœa, calculus, and ulcerations of the urinary organs. In checking the increased secretion of mucus from the bladder, which constitutes the first of these diseases, it appears to be superior to other astringents ; it affords relief, probably by its action on the stomach preventing the generation of acid. More lately it has been recommended in phthisis, and some cases of cough, accompanied with symptoms of hectic, in which advantage was derived from it, have been related. Its dose is half a drachm of the leaves in powder, twice or thrice a-day.

Acacia Catechu. *Polygam. Moneoc. Lomentaceæ.* (*Acacia Catechu. Ph. Lond.*) *India. Ligni Extractum. Catechu. Terra Japonica.*

To this substance formerly known by the absurd name of Japan Earth, the appellation of Catechu is now appropriated. The tree which affords it (formerly regarded as a species of Mimosa, but referred by Wildenow to a new genus, and named by him Acacia Catechu) is a native of India. The catechu is an extract prepared from its interior hard wood, by boiling it, cut into chips, in water ; the decoction is evaporated ; it is inspissated by exposure to the heat of the sun, and by continued exposure is rendered concrete and dry. It is of a yellow or brown colour, has a bitter and astringent taste, leaving an impression of sweetishness ; but its qualities vary considerably, owing to its being prepared with more or less care, or even, as has been affirmed, to its being obtained from different plants. Two kinds are met with in the shops ; one is of a light yellowish brown colour, is smooth and uniform in texture, breaks short, is soft and light ; the other

is of a dark brown colour, more heterogeneous, heavier and considerably harder.

Catechu is almost entirely soluble in water with the assistance of heat, the residuum consisting of accidental impurities. It is nearly equally soluble in alcohol. Its solution strikes a deep black colour with salts of iron, and gives an abundant precipitate with animal gelatin. From Davy's experiments, it appears to be composed of tannin, extractive matter, and mucilage: the proportions in the best catechu being 54.5 of the first, 34 of the second, 6.5 of the third, and 5 residual matter. Our knowledge with regard to the principle named Extract is so imperfect, that it is difficult to establish any conclusion with regard to it; and the subsequent experiments of Dr. Bostock, as to the modes of separating the Extract from the Tannin of catechu, do not exactly accord with those of Davy. Dr. Bostock has remarked, too, that catechu gives indications of the presence of gallic acid, and that its watery infusion even reddens the more delicate vegetable colours.

Catechu is in common use as an astringent, and in the uniformity and certainty of its operation is probably equal, or even superior to any of the vegetable astringents. It is the astringent most commonly and successfully employed in diarrhœa; it is also used in chronic dysentery, and sometimes in passive hæmorrhages. It is given under the form of the infusion, or the tincture; or the officinal preparation, the electuary of catechu, consisting of catechu and kino, with some aromatics and a little opium, is diffused in water, forming what has been named the Japonic Mixture, and which affords one of the best forms for its administration. In substance it may be given in a dose from 10 to 20 grains, which may be frequently repeated. Under the form of troches, it is sometimes used in relaxation of the uvula, or sponginess of the gums, being allowed to dissolve slowly in the mouth.*

Offic. Prep.—Elect. Catechu. Inf. Catech. Tinct. Catech.—*Ed. Lond. Dub.*

Kino. Kino.

The substance distinguished by this name was introduced a number of years ago into the Materia Medica as a powerful astringent, little being known with regard to its origin, farther than it was said to be the produce of Africa, and obtained probably from the plant affording it by exudation, Subsequent to its introduction, it was met with in the shops very various in its qualities; it still is so, and is obviously of different origin, though there is considerable obscurity with regard to the natural history of these varieties. The London College have described it as the extract of an African plant unknown. The Edinburgh College have inserted it in their catalogue of simples, as the concrete juice of the Eucalyptus Resinofera,—a tree a native of New Holland; and there is reason to believe that part of what is called Kino in the shops is imported from that country, and is the produce of this vegetable. The Dublin College have considered kino as the product of the Butea Frondosa, on the authority of Roxburgh; but incorrectly, as Dr. Duncan has remarked. He has further observed, what is just, that much of the kino of the shops bears the appearance of

* *Incompatible Substances.* The astringency of catechu is destroyed by alkaline salts, and precipitates are produced by metallic salts, especially by those of iron; and with gelatin it forms an insoluble compound. Paris. *Ed.*

an extract artificially prepared, and is known to be formed from different astringent vegetables.*

It is not easy to discriminate exactly among these various substances, and to assign to each its real origin. One variety, which bears the highest price in the shops, has the appearance of a natural production : slender twigs are intermixed in its substance ; it is of a reddish brown colour, with a resinous lustre, is very brittle, feels gritty between the teeth, and has a bitterish taste. This corresponds in its characters with the substance first introduced as kino, and is said to be the produce of Africa, and to be imported from Senegal: the plant which affords it is unknown. The kind from New Holland has also the appearance of a natural production, fragments of bark being intermixed with it; it is in more solid masses than the other, is less brittle, and with its astringency has a disagreeable mawkish sweetish taste. The third kind has the appearance of an extract thoroughly dried ; it is in small fragments, with a resinous fracture, is of a brown colour, nearly black, and has a taste astringent and slightly bitter. This Dr. Duncan has stated to be the produce of the Coccoloba Uvifera. I have been informed, that it is the Extract of the wood of the mahogany.

The analysis of kino has been executed ; but from the difficulty of ascertaining exactly to what substance the name is applied, there is a difficulty in appropriating the results to any of the varieties that are met with. All of them appear to contain a large proportion of tannin ; their solutions giving a deep colour, usually rather green than purple, with salts of iron, and a copious precipitate with gelatin. They are partially soluble in water and in alcohol. Diluted alcohol is their most perfect solvent. They appear to consist therefore of tannin, resinous matter, and mucilage.

Kino has been employed as an astringent for the same purposes as catechu, and they are often given in combination. The catechu, being more uniform in its qualities, ought perhaps to be preferred. Of the different varieties of kino, that to which the name was originally given, imported from Africa, is the most grateful, and appears too, to be the most active astringent.†

Offic. Prep.–Tinct. Kino. *Ed. Lond. Dub.*–Pulv. Kino Comp. *Lond.*

Pterocarpus Draco. Sanguis. Draconis. *Dragon's Blood. Diadelph. Decand. Papilionaceæ. Resina. South America.*

The substance to which the absurd name of Dragon's Blood has been given, is a resinous concrete of a dark red colour and heterogeneous texture, varying also frequently in its qualities as it is met with in the shops. When genuine, it is the produce, by exudation, from incisions in the bark of the above tree. It is insipid ; and though it has been considered as an astringent, has probably no such power, nor is it now applied to any medical use.

Pterocarpus Santalinus. Santalum Rubrum. Red Saunders. *Diadelph. Decand. Papilionaceæ. India.*

The wood of this species is of a very deep red colour, which it yields to alcohol, but not to water. It was once supposed to be astringent ; but it is altogether inert, and is used only to give a colour to tinctures.

* According to Dr. Paris, the plant which produces *Kino*, is satisfactorily proved to be the *Pterocarpus Erinacea. Ed.*

† *Incompatible Substances.* The same as the Galls. *Ed.*

Pistacia Lentiscus. Mastiche. Mastich. *Dioecia. Pentand. Amentaceæ. Resina. South of Europe.*

The resin named Mastiche is the produce of this shrub by exudation, and is imported from the island of Chios. It is in small round fragments of a light yellowish colour, nearly transparent, brittle, and hard, but when pressed or chewed becoming tenacious. It is chiefly resinous, and is hence dissolved by alcohol, a substance however remaining undissolved, tenacious and elastic, approaching in its characters to caoutchouc. Mastiche is insipid, and nearly inodorus, giving only a slightly fragrant smell when heated. Though it has been regarded as an astringent, and as such was at one time employed in medical practice, it has no activity, and might be discarded from the Materia Medica. It is used, from its insolubility and tenacity, to fill up the cavity in carious teeth.

[Geranium Maculatum. Spotted Geranium. Common Cranesbill. *Monadelphia Decandria.* Nat. Ord. *Succulentæ. United States. Radix.*

This plant is found in abundance in every part of the United States, and is generally to be met with in low grounds and the vicinity of damp woods. Its time of flowering is in May and June. In its Medicinal properties this plant is decidedly astringent, the experiments of Dr. Bigelow having shown it to contain even a larger proportion of tannin than the Kino. In almost every case where vegetable astringents are called for, the Geranium may be advantageously exhibited. In chronic dysenteries, diarrhœa, and other debilitating discharges from the bowels, it has acquired great celebrity. Dr. Barton testifies to its virtues in the cholera of infants. In this case the preferable mode of giving it is in a decoction of milk. As a gargle it has been found very serviceable in aphthous eruptions and ulcerations of the mouth and throat. The Geranium may be given in powder, in doses of from 20 to 30 grains—in extract, 10 grains—in tincture, ʒj to ʒij—in decoction and infusion, from ℥j to ʒij. B.]

[Statice Limonium. Marsh Rosemary. *Pentand. Pentagyn.* Nat. Ord. *Aggregatæ. Radix.*

The Marsh Rosemary is a perennial plant, flourishing in salt marshes. It is found in great abundance in the vicinity of this city, and flowers in the months of July and August. The root, which is the part used in medicine, is intensely astringent, and on chemical analysis is found to contain large proportions of tannin and gallic acid. As a medicine it is quite popular in this country, and has been prescribed with advantage in various diseases where astringents are indicated. In chronic dysentery it is said to have succeeded in effecting a cure after several other tonics and astringents had been used to no purpose. It has also proved successful in diarrhœa, cholera infantum, hæmoptysis, &c. In Cynanche Maligna, much advantage has been derived from its use when administered as a gargle in the form of decoction. The Rosemary may be given in infusion or decoction by adding ʒij of the root to ℥xij of water.—B.]

SECOND DIVISION.—OF LOCAL STIMULANTS.

Under this division are comprehended those remedies, the stimulant operation of which is directed to particular organs. It comprises Emetics, Cathartics, Diuretics, Sialogogues, and those various classes that have usually been arranged under the title of Evacuants, their local operation giving rise to increased secretion, or increased evacuation.

CHAP. VII.

OF EMETICS.

Emetics are defined, Medicines which excite vomiting, independent of any effect arising from the mere quantity of matter introduced into the stomach. This definition, however, requires to be more limited; for there are many substances which occasionally induce vomiting, that are not usually ranked as emetics. All bitter and nauseous drugs have this effect, when given in large doses, or in an irritable state of the stomach; and it occurs frequently as the consequence of the action of stimulants and narcotics. The emetic operation, however, in these cases, is neither uniform nor certain: there are, on the contrary, a number of substances, many of which have no very nauseous taste, or which can have that taste concealed, but which still excite vomiting when given in a sufficient dose, in every individual, and in every state of the stomach. To these substances the appellation of Emetics is exclusively applied. They may therefore be defined, – Substances which excite vomiting, independent of any effect arising from the quantity of matter introduced into the stomach, and independent of any nauseous taste or flavour, or of any narcotic or acrid power.

When an emetic has been given in a proper dose, the stomach remains for some time undisturbed. But in 10, 15, or 20 minutes, an uneasy sensation, with nausea, supervenes, which continues increasing until vomiting begin. While the nausea only is present, the countenance is pale, the pulse is feeble, quick, and irregular, and there is a feeling of cold; but during the action of vomiting the face becomes flushed, the pulse is quickened, though still feeble, and it remains so in the interval of vomiting. The vomiting generally recurs twice or thrice, and then ceases; a degree of nausea continues, which goes off only gradually; languor remains, with often a disposition to sleep; the pulse is weak and slow, but becomes gradually fuller; the skin is usually moist.

The general theory of the operation of vomiting is sufficiently evident. The vermicular or peristaltic motion of the stomach, by which the food is propelled through the pylorus, is inverted; the diaphragm and abdominal muscles are excited to contraction; the pylorus is contracted, and the contents of the stomach are forcibly discharged upwards. In many cases of vomiting, especially when violent, the peristaltic motion even of the upper part of the intestinal canal is also inverted, and bile is brought from the duodenum.

At the same time, it is difficult to explain how the peristaltic motion is

inverted by emetics. It is a singular fact, that any substance acting as an unusual stimulus on the stomach seldom increases its motion, so as to occasion a more speedy discharge of its contents by the pylorus. The motion, instead of being increased, is more commonly inverted, and hence vomiting is the effect peculiarly resulting from such local stimulant action. Nor is it easy to assign any cause for this specific operation.

Dr. Darwin gave a different explanation of the nature of vomiting. He considered it as the effect, not of increased but of decreased action of the fibres of the stomach. When an emetic is administered, it produces, he observes, the pain of sickness, as a disagreeable taste in the mouth produces the pain of nausea: these uneasy sensations not being acutely painful, do not excite the organ into greater action, but rather repress the motions already existing. The peristaltic motion of the fibres of the stomach becomes languid from the want of the usual stimulus of pleasurable sensation, and in consequence stops for a time, and then becomes inverted, which gives rise to the phenomena of vomiting. In this hypothesis, there is however equally a deficiency in explaining how the inversion of the motion is effected.

Some have supposed, that the internal surface of the stomach is the part immediately effected by the action of the emetic, and that the diaphragm and abdominal muscles are called into action by association; while others suppose the diaphragm and abdominal muscles to be chiefly affected, and to be so in consequence of nervous irritation; the former opinion resting principally in the circumstance, that the inner surface of the stomach is the part more directly exposed to be acted on, the latter being founded on the fact observed by experiment, that in vomiting, the stomach itself does not contract, and that all the phenomena of vomiting are excited by emetics injected into the veins, or applied to a wound. The strong and forcible contraction of the diaphragm seems to have the principal share in producing vomiting.

There is a considerable difference among individuals with regard to the facility with which vomiting is excited. This susceptibility is also liable to be altered by disease. In the greater number of febrile affections, vomiting is easily excited; while in several of the diseases of the class Neuroses, as mania, melancholia, and hypochondriasis, it is excited with much more difficulty. In the case of poisons, which induce inflammation of the stomach, vomiting is almost a constant symptom; while in those which act by a narcotic power, and in which the irritability of the stomach is impaired, a powerful emetic is required to produce any effect.

Although nausea or sickness generally accompanies vomiting, this connection is not a necessary one. Some emetics, as sulphate of zinc, act without occasioning much nausea; while others, as tobacco, excite it in a greater degree than is proportioned to their emetic power,—a circumstance sometimes requiring to be attended to in the administration of individuals of this class.

The feeble and low state of the pulse, which attend vomiting, has been ascribed either to direct association between the motions of the stomach and those of the heart; or to the nausea excited, which, like other disagreeable sensations not acutely painful, has a depressing effect, being equivalent to an abstraction of stimulus.

Emetics, at least those which are mild in their operation, do not appear to waste the irritability of the stomach: they have rather an opposite effect: hence digestion is often vigorous after vomiting, and hence too gen-

tle emetics are often serviceable in dyspepsia, and in the temporary diminished tone of the stomach occasioned by intoxication.

The state of the stomach produced by vomiting seems to be often extended to the vessels of the skin; it is therefore followed frequently by diaphoresis, and is one of the most powerful means of removing spasmodic stricture from the surface of the body.

Emetics have a remarkable power of increasing absorption; hence the benefit they afford in anasarca, and the sudden disappearance of tumors which sometimes happens after violent vomiting.

Emetics frequently occasion increased evacuation from the intestinal canal; and if they fail to excite vomiting, very generally operate as cathartics. Some are more apt to have this effect than others, as the preparations of antimony compared with ipecacuhan.

From the different indications which emetics are capable of fulfilling, they are adapted to the treatment of many morbid affections.

Where disease depends on a disordered state of the stomach, arising from over-distention, the presence of acrid or indigestible matters, or any other cause, vomiting is the easiest and most effectual mode of affording at least present relief. Hence its utility in all cases of indigestion, impaired appetite, acidity in the stomach, pyrosis, or anorexia; in the symptoms arising from intoxication, and where poisons of any kind have been swallowed.

From the strong action of the diaphragm and abdominal muscles in vomiting, the gall-bladder and hepatic ducts are emptied of their contents; hence jaundice, owing to obstruction from biliary calculi, is sometimes suddenly relieved by vomiting. A similar pressure is supposed to be exerted during vomiting on the thoracic viscera; from this has been explained the expectorant effect of emetics, and the relief they afford in some varieties of asthma and catarrh.

In the varieties of febrile diseases, much advantage is derived from the administration of an emetic, especially in the commencement of the disease. In synocha, where there are symptoms of increased action, and particularly where there is a determination of blood to the head, full vomiting may be attended with danger; and in typhus, when fully established, it cannot be expected to be of much benefit. But in the slighter cases of pyrexia, it is often attended with marked advantage. The emetic should be given in the evening, as its operation leaves a tendency to sleep, and to diaphoresis, which it is useful to promote.

At one time, the practice of giving emetics in fever, in such doses as to excite nausea without producing vomiting, was common, but is now less frequent. It is more distressing to the patient, and does not appear to be equally effectual in stopping the progress of the disease. This mode, however, of giving nauseating doses of emetics, is useful in hæmorrhage, where full vomiting would be dangerous, the nausea diminishing the force of the circulation; it is therefore sometimes employed in hæmoptysis and menorrhagia.

From the powerful effects of emetics, their improper administration may be injurious, and there are various states of the system which prohibit their use, or allow them to be employed only with caution. During the operation of vomiting, the blood returns with more difficulty from the head, owing partly to the pressure on the descending aorta. and partly to the interrupted respiration, by which the transmission of blood through the lungs is impeded; hence the redness of the countenance and the vertigo

which sometimes accompany it. From this cause it must be attended with danger where there are symptoms of determination to the head, and more especially in plethoric habits. From the strong action of the abdominal muscles exerted in vomiting, it has been considered as not without risk in visceral inflammation, in the advanced stages of pregnancy, and in hernia and prolapsus uteri. In extreme debility, there is danger of the patient sinking under the violence of the operation. The frequent repetition of emetics in chronic diseases is prejudicial, by weakening the tone of the stomach, and rendering its motion more liable to be inverted by slight causes.

The mode of administering emetics does not admit of many general observations. They should be given in the form of draught ; as if in a solid form, the emetic might pass from the stomach into the intestines, without exciting vomiting. A common practice is to promote the action of emetics by taking large draughts of tepid water, or of an infusion of camomile. If an emetic is given in a large dose, this is not necessary, as it will excite vomiting repeatedly at intervals ; but if given in a moderate dose, it may excite vomiting only once ; nausea and efforts to vomit will recur, however, at intervals, and then vomiting may be renewed by a draught of tepid water, or of a bitter infusion. We thus obtain the advantages of repeated vomiting, without the risk attending a large dose of a powerful emetic. Too large a draught ought not to be taken, as it renders the operation more difficult or painful. Some acrid emetics, as mustard, require always to be largely diluted

The most natural subdivision of this class is into Emetics from the Vegetable, and from the Mineral Kingdom.

EMETICS.

FROM THE MINERAL KINGDOM.

Antimonium. Zincum. Cuprum.

Ammonia. Hydro-Sulphuretum Ammoniæ.

FROM THE VEGETABLE KINGDOM.

Callicocca Ipecacuanha.
Scilla Maritima.
Anthemis Nobilis.
Sinapis Alba.
Asarum Europæum.
Nicotiana Tabacum.

EMETICS FROM THE MINERAL KINGDOM.

Antimonium. Stibium. Antimony.

The metal to which this name is given is peculiarly distinguished as an evacuant, and under various forms of preparation furnishes some of our most powerful cathartics, diaphoretics, and expectorants. All its preparations in larger doses act as emetics, and several of them are in common use for their emetic power It is therefore under this class that its general history may be introduced.

Antimony, in the modern chemical nomenclature, is the name applied to

the pure metal. It occurs in nature combined with sulphur, and to this ore the name of Antimony was once generally given by chemical and medical writers; the epithet Crude being added to distinguish it, when it is melted out from the impurities mingled with it. The ore in this state is now named Sulphuret of Antimony, and the name Antimony is appropriated to the metal itself.

The native sulphuret of antimony is of a grey or blue colour, with metallic lustre; it is opaque, and has usually a striated texture. To free it from the earthy matter with which it is mixed, as it is dug from the vein, it is fused; the fused sulphuret subsides, and is run off. Its lustre is greater the more completely it is purified. The proportions of its principles are various; sometimes they are nearly equal; in other specimens the quantity of metal is larger; and there are some varieties unfit for medicinal use, as containing other metals, particularly lead, and sometimes copper. These have inferior lustre and a less distinctly striated texture.

The pure metal is usually obtained by fusing the ore with iron filings, the iron combines with the sulphur, while the antimony, being very fusible, is run out. The metal is of a bluish-white colour, and a plated texture, has a specific gravity of 6.7, is moderately hard, and very brittle; it melts at a heat not much higher than that of ignition, and is volatilized by a heat not very intense; it is oxidated by exposure to the air at the temperature at which it is volatilized; and in the state of oxide, it is capable of combining with the greater number of the acids.

The sulphuret of antimony has little activity, and indeed produces scarcely any sensible effect on the system. The preparations of the metal are much more active, and though of very different degrees of strength, retain the same mode of action, and possess therefore the same medicinal virtues. They do not exert any general stimulant operation on the system, but are always directed in their action to particular parts, so as to occasion some sensible evacuation, thus acting as emetics, cathartics, or diaphoretics.

The principal general medicinal application of antimony, under its different forms of preparation, has been for the cure of febrile affections; and in the treatment of fever, it has long been more or less extensively used. It is given either so as to induce vomiting or purging, or sometimes in smaller doses, so as to produce only gentle diaphoresis; and exhibited in either mode in the commencement of the disease, it has been considered as capable of cutting short its progress. The use of James's powder, which is an antimonial, has been extensive with this view; and both it, and the tartrate of antimony and potash, or emetic tartar, continue to be used. Their efficacy has usually been ascribed to the evacuation they occasion, while others have considered antimony, apparently with little reason, as exerting an action specific or peculiar in itself in the removal of febrile action, and not explicable on the known effects it produces. The practice of giving antimonials in fever is unquestionably often attended with marked advantages; yet it is also liable to considerable difficulties, and is not without some hazard. The administration of the remedy, whatever antimonial be employed, is not easily regulated with precision; in small doses it often fails of producing the favourable crisis expected from its operation; and in larger doses it is liable to act with violence, and produce evacuations under which the powers of the system have sunk. It is principally in the commencement of fever that the practice is successful;

in the more advanced stages, when the state of debility is induced, more hazard attends its employment, and less benefit is to be expected from it.

Antimonials are administered with advantage in intermittent as well as in continued fever, in the phlegmasiæ and exanthemata, and even in several of the profluvia, probably from their evacuating operation.

As an emetic, antimony is distinguished by the certainty, extent, and permanence of its operation. The action it excites in the stomach is both more forcible, and continues for a longer time, than that from other emetics, and hence it produces more complete evacuations, and occasions in a greater degree all those effects which result from the action of vomiting. Its action is also less local. It is generally extended to the intestinal canal, so as to produce purging, and very frequently to the surface of the body, so as to occasion diaphoresis or sweat. It is used more particularly where the effects of full vomiting are required ; but where these are not wished for, more gentle emetics are usually preferred : The antimonial emetics, even the emetic tartar, which is the mildest, and the one most easily regulated, are always liable to prove harsh in their operation ; they occasion severe vomiting, debilitate the stomach, and are altogether unfit for administration to children, or to those of weak and irritable habits. The propriety of caution in the use of the preparations of antimony is rendered more obvious, perhaps, from the strict analogy which exists between it and arsenic in their operation. In Mr. Brodie's experiments, emetic tartar produced, when applied to a wound, vomiting, reduction of the pulse, paralysis, insensibility, and death, and the stomach was sometimes found inflamed. And it is given with less immediate risk than arsenic, probably principally from its greater emetic power.

Of the preparations of antimony, it is necessary to take only a very cursory view, as they are to be more fully noticed in the pharmaceutical part of the work. They may be arranged under those in which the metal is combined with sulphur ; those in which it is oxidated ; and those in which it is brought into a saline state by combination with acids.

Of the first class, the Levigated Antimony, (Sulphuretum Antimonii Præparatum), which is merely the native sulphuret reduced to a state of mechanical division, is the only preparation. It has been given as a diaphoretic, especially in chronic rheumatism, and in some cutaneous affections, in a dose from 15 grains to 1 drachm ; but it is so inert and uncertain, that it is now discarded from practice.

The oxides of antimony are more active, but they are liable to the inconvenience of being uncertain in their operation, partly perhaps from their activity being dependent on the state of the stomach with regard to acidity, partly from the various degrees of oxidation in which they may exist, and which are not easily rendered uniform, and partly too from their state of aggregation. Proust supposed, that there are only two oxides of antimony, one at the *minimum*, containing 18.5 of oxygen in 100 parts, the other at the *maximum*, containing 23 of oxygen. This supposition rested principally, however, on assumption, that metals are susceptible only of two degrees of oxidation. Thenard has endeavoured to prove, that there are six oxides of antimony capable of being distinguished ; the one in the lowest degree of oxidation, containing not more than 0.0 . of oxygen, that in the highest degree containing 0.32. Berzelius contends for the existence of four oxides, and the one at the *maximum* of oxidation he considers as an acid, and names it Acidum Stibicum. It is obtained by deflagrating antimony with a large quantity of nitre. He also supposes the existence of

what he calls Acidum Stibiosum. It may be doubtful if these degrees of oxidation are established with precision : but it is sufficiently probable, that antimony combines with very different quantities of oxygen.

The following oxides of antimony retain a place in one or other of the Pharmacopœias.

Oxidum Antimonii cum Phosphate Calcis, also named Pulvis Antimonialis.—This is prepared by exposing to heat sulphuret of antimony and bone-shavings, until they are converted into a grey-coloured substance, which is then exposed in a crucible to a more intense heat, until it become white. The Edinburgh and Dublin Colleges order equal weights of the sulphuret of antimony and bone-shavings ; the London College have altered the proportion to two parts of the latter to one of the former, which must give rise to a diversity of strength in the product By the high temperature the animal matter of the bones is decomposed, the sulphur of the sulphuret is dissipated, the metal is oxidated, and this oxide remains mixed or combined (part of it being also in a vitrified state) with the phosphate of lime of the bones. The preparation is similar in composition to the celebrated James's Powder, for which it is designed as a substitute. It acts as a diaphoretic, emetic, or cathartic, according to the dose in which it is administered, and is employed principally as a remedy in fever, to arrest the progress of the disease at its commencement, or in its more advanced stages to obtain a favourable crisis. It is given in a dose from 5 to 10 grains, repeated, if necessary, after an interval of five or six hours, until sweating, purging, or vomiting, is induced. Its peculiar advantages are, that with a considerable degree of activity, it is less harsh in its operation, and more uniform, than some of the other antimonial oxides, while, from its insolubility, it acts less rapidly on the stomach than emetic tartar does : it is therefore less liable to excite nausea or vomiting, and can be given so as to obtain with more certainty the general action of antimonials on the system. Its exhibition is best adapted to those forms of fever in which there is increased vascular action ; in typhus, less advantage can be expected from it, and it is even hazardous, from the excessive evacuations it is liable to induce.

Sulphuretum Antimonii Precipitatum.—This name, obviously incorrect, is given by the London and Edinburgh Colleges to a preparation formerly named Sulphur Auratum Antimonii. The Dublin College have named it Sulphur Antimoniatum Fuscum. It is prepared by boiling sulphuret of antimony with a solution of potash, and adding to the filtered liquor sulphuric acid, while any precipitate is thrown down. This precipitate is of a reddish yellow colour ; it is a combination of oxide of antimony with sulphuretted hydrogen and sulphur, and might be named Hydro-sulphuretum Oxidi Antimonii. In a dose from 5 to 10 grains, it produces the usual effects of antimonials, and has been employed as a remedy in fever ; but from the uncertainty of its operation, it is discarded from practice.

The analogous preparation named Kermes Mineral, which is used on the Continent, is the precipitate that subsides on cooling from the liquor formed by boiling a solution of potash on sulphuret of antimony ; it differs from the former in containing less sulphur, and appears, indeed, to be merely a combination of oxide of antimony with sulphuretted hydrogen. It is given in a similar dose.

Oxidum Antimonii.—Under this name, a preparation is inserted in the London Pharmacopœia, obtained by decomposing tartrate of antimony

by sub-carbonate of ammonia. It has been introduced in place of a preparation formed by boiling sulphuret of antimony in muriatic acid, with the addition of nitric acid, straining the liquor, and adding to it a solution of sub-carbonate of potash. This, which is probably a sub-muriate, has a place in the Dublin Pharmacopœia, under the name of Oxydum Antimonii Nitro-Muriaticum. It is designed to be employed only in the preparation of other antimonials.

By combining the oxides of antimony with an acid, the sources of uncertainty in their operation are in a great measure removed, as their degree of oxidation is rendered determinate, and their activity is not influenced by the state of the stomach with regard to acidity. The greater number of these saline combinations, however, are too acrid to admit of internal administration, and there is one only, that in which the oxide of antimony is combined with tartaric acid, employed in practice. Of all the antimonials, this is most extensively used, and it is also the principal emetic derived from the mineral kingdom.

This preparation is the Emetic Tartar of the old nomenclature, the Tartrate of Antimony and Potash, (Tartras Antimonii et Potassæ,) improperly named in the Pharmacopœias, Tartras Antimonii, and Antimonium Tartarizatum.* It is obtained by boiling super-tartrate of potash with oxide of antimony: the brown oxide obtained by the deflagration of sulphuret of antimony with nitre, is ordered by the Edinburgh College; the white oxide, or rather sub-muriate, obtained from the decomposition of muriate of antimony, is employed by the Dublin College. In all these processes, the excess of tartaric acid in the super-tartrate is saturated by the antimonial oxide; and by evaporation and crystallization, a triple salt, tartrate of antimony and potash, is procured. Its crystals are triedral pyramids, generally small; and it is readily soluble in water. It consists, according to Thenard's analysis of it, of 38 of oxide of antimony, 16 of potash, 34 of tartaric acid, and 8 of water of crystallization.

Tartrate of antimony and potash is superior to all the antimonials as an emetic; as with a degree of activity, which admits of its being administered with safety, its operation is sufficiently certain and uniform; hence it is the only antimonial emetic that is now used. It usually excites vomiting in the dose of a grain, or a grain and a half; but the proper mode of administering it is in divided doses, three or four grains being dissolved in four ounces of water, and an ounce of this solution being given every quarter of an hour until it operate. It generally excites full vomiting, and is liable to be more harsh in its operation than the milder emetics, such as ipecacuan, evacuating not only the contents of the stomach, but inverting even the motion of the duodenum, and either by this or from the compression exerted by the action of the muscles on the abdominal viscera, causing bile to be discharged: it also frequently excites purging. In many cases, however, these are advantages, and in such cases, as well as in all morbid affections, where the stomach is not easily affected, it is the emetic properly employed; while, when the stomach is irritable, where its contents are merely to be evacuated, or when the system is in a debilitated state, the milder emetics are to be preferred. In smaller doses it has been employed as a nauseating remedy in fever,—a practice now near-

* *Incompatible Substances.* Mineral acids, alkalies, and their carbonates, most of the metals, soaps, hydro-sulphurets, infusions and decoctions of bitter and astringent vegetables, such as cinchona, &c. infusion and tincture of galls and rhubarb. Paris. *Ed.*

ly relinquished. Assisted in its operation by tepid diluents, it may be brought to operate as a diaphoretic, and to produce the effects of antimonials on the general system, though from its action being exerted at once on the stomach, owing to its solubility, it is more difficult to administer it with this intention, without occasioning nausea or vomiting, than some of the less active antimonials, as the phosphate of antimony and lime. Applied to the skin by friction, it acts on the system, and produces also its usual effects on the stomach. Applied to a wound it occasions vomiting, and if in a concentrated state, produces insensibility, paralysis, and the other effects of mineral poisons ; in its action indeed, it bears a strict resemblance to arsenic ; and this analogy undoubtedly suggests, as has already been remarked, the necessity of employing it with caution.

Vinum Tartratis Antimonii.—This name is given to a solution of tartrate of antimony and potash in white wine, in the proportion of two grains to the ounce. It is intended as a substitute to what was formerly named Antimonial Wine,—a preparation obtained by digesting wine on oxide of antimony, and which owed its power to the portion of oxide which the tartaric acid of the wine dissolved. A similar preparation is inserted in the London Pharmacopœia, under the name of Liquor Antimonii Tartarizati, in which the tartrate of antimony and potash is dissolved in wine diluted with water. The propriety of either is doubtful. It has no advantage over a solution of extemporaneous preparation ; and there is some reason to believe, that the tartrate in this state of solution is liable to spontaneous decomposition. In the preparation of the London College, this will probably happen still more readily from the dilution of the wine. It is principally as a diaphoretic that antimonial wine has been employed, in a dose of one drachm, its operation being often promoted by combination with tincture of opium.

ZINCUM. Zinc. (P. 121.)

SULPHATE of Zinc, it has already been remarked, is a powerful emetic. It is not employed in common cases, in which an emetic is indicated, but it is had recourse to, as it operates speedily, and with much force, in cases where it is of importance that the contents of the stomach should be immediately evacuated, but where it is difficult to excite vomiting, as where any narcotic poison has been swallowed. Its dose is from 5 to 20 grains, according to the state of the stomach ; it should be given in solution, in three or four ounces of water.

CUPRUM. Copper. (P. 122.)

SULPHATE of Copper acts as an emetic, and its operation takes place almost as soon as it has reached the stomach, and without inducing much nausea. It has hence been recommended in some cases, where the object is merely to obtain the mechanical effects from the operation of vomiting, as incipient phthisis, in which advantage has been supposed to be derived from the compression exerted on the thoracic viscera. Its operation is, however, liable to be very harsh, even in the small dose of 1 or 2 grains, in which it has been prescribed. In a larger dose, it has sometimes succeeded in producing vomiting, where the stomach, from the operation of a narcotic poison, has not been affected even by the sulphate of zinc. In such cases, where the irritability of the stomach is greatly impaired, and the patient is nearly in a state of insensibility, it has produced instantaneous vomiting, when given to the extent of 10 or 15 grains dissolved in wa-

ter; and, therefore, in very urgent cases, or where the tartrate of antimony or sulphate of zinc has failed, it may be employed with propriety. The acetate or sub-acetate of copper has, like the sulphate, an emetic power, and has been employed in similar cases in a dose of one or two grains. They are liable to the same disadvantages.

Ammonia. Ammonia. Volatile Alkali.

Ammonia exists naturally in the gaseous form, but is condensed in very large quantity by water; and this solution, for the preparation of which formulas are given in the Pharmacopœias, is the form under which it is applied to different medicinal purposes. It is capable of fulfilling various indications: it in particular acts as a diaphoretic, antacid, and externally as a rubefacient. Under some of these classes, it is to be more fully considered. It operates as an emetic when given in a pretty large dose, and is sometimes employed to quicken the operation of other emetics where they have failed, a tea-spoonful being given in a cup-full of cold water, and a draught of tepid water being swallowed after it.

Hydro-sulphuretum Ammoniæ.—The Hydro-sulphuret of Ammonia, obtained by passing a current of sulphuretted hydrogen gas through a solution of ammonia in water, was introduced into practice by Dr. Rollo, and has been received into the Edinburgh Pharmacopœia. It acts with much energy on the stomach, inducing nausea in a small dose, and in a larger dose occasioning vomiting. It is scarcely used as an emetic, but rather as a nauseating remedy; and the principal application of it has been in the treatment of diabetes, with the view of reducing the morbid appetite, and increased action of the stomach. It was given at its introduction in a dose of from 5 to 15 drops twice a day, and in different cases with advantage, so far as related to the reduction of the increased action of the digestive organs: and where this indication is to be fulfilled, no remedy seems better adapted to it.

EMETICS FROM THE VEGETABLE KINGDOM.

Ipacacuanha. Ipecacuan. Callicocca Ipecacuanha. Cephaëlis Ipecacuanha. *Pentand. Monogyn. Aggregatæ. Radix. South America.*

The natural history of this vegetable is still obscure, and the obscurity is increased by the roots of different plants being sometimes met with in the shops as ipecacuan. Hence the plant affording it has been successively referred to different genera. It is now, by the Edinburgh and London Colleges, referred to the genus Callicocca, and distinguished as a species by the name Ipecacuanha; and as the genus Callicocca is united by Wildenow with that of Cephaëlis, the name Cephaelis Ipecacuanha is also given to it. It is still uncertain, however, whether the two more common varieties of Ipecacuan, the Peruvian and the Brazilian, are the roots of the same vegetable: while the latter is the species referred to in the Pharmacopœias, the former has been said to be a different species; and the roots of other plants are also said to be sometimes mixed with these.

That usually met with, the Grey Ipecacuan as it is named, is in small wrinkled pieces, externally grey, internally whiter; has a faint smell, more obvious in the powder, and a bitter, slightly acrid taste. It contains both a resinous and gummy matter, or at least a matter principally soluble in alcohol, and another more soluble in water. It is generally stated, that its emetic power, and indeed its principal virtues, reside in the former. Dr. Irvine has affirmed that they depend on the latter. Its active matter is completely extracted by proof-spirit or wine. Vinegar likewise dissolves it, but at the same time weakens its power. By decoction with water, its activity is greatly impaired, though the water distilled from it has scarcely any emetic effect. It is even injured by being kept long exposed in the state of powder to the air and light.

The principle on which the virtues of this medicine depend, was lately discovered by M. M. Magendje and Pelletier, from whom it received the name of *emetin*. It is of a brownish-red appearance, inodorous, of a slightly acid taste, soluble in water, but does crystallize. It is insoluble in sulphuric ether, but is easily soluble in alcohol. It is precipitated from its solution by gallic acid, infusion of galls, acetate of lead, and the corrosive muriate of mercury. It is decomposed by nitric acid, and is dissolved, without being altered in its properties by the phosphoric and muriatic acids. Half a grain of it produces violent vomiting, followed by sleep; six grains are said to occasion death.

Ipecacuan is the mildest of those emetics which are at the same time sufficiently certain in their operation; and the acquisition of it has been an advantage in modern practice. It evacuates the contents of the stomach without exciting violent vomiting, or extending its action beyond this organ; it is hence adapted to cases where an excess of effect would be prejudicial; and as a mere evacuant, is preferable to every other emetic. The mildness and certainty of its operation render it also the emetic best adapted to children. The medium dose of it as an emetic, is 15 grains to an adult, though 20 or 30 may be taken with perfect safety, as it only operates more speedily; and a full dose is even preferable to a smaller one, as more certain, and producing less nausea. The officinal infusion of it in white wine acts as an emetic in the dose of an ounce. Though principally employed as an emetic, ipecacuan is occasionally prescribed with other views. It was originally introduced as a remedy in dysentery, given either in such a dose as to produce full vomiting, or in the quantity of 2 or 3 grains repeated every three or four hours, till it occasioned vomiting, diaphoresis, or purging. It has been given in a similar mode in obstinate diarrhœa. In spasmodic asthma, it is exhibited in a full dose to relieve the paroxysm; and in a dose of 3 or 4 grains continued every morning for some weeks to prevent its recurrence. A singular idiosyncracy has been observed in some individuals with regard to it, difficulty of breathing being induced by the effluvia arising from it in powder, especially when it is diffused in the air. In hæmorrhages it is given in nauseating doses, the nausea diminishing the force of the circulation. Combined with opium it forms a very powerful sudorific.*

Offic. Prep.—P. Ipecac. et Opii. Vin. Ipecac. *Edin. Lond. Dub.*

* *Incompatible Substances.* All vegetable astringents, as infusion of galls, &c. vegetable acids, especially the acetic. Paris. *Ed.*

Scilla Maritima. Squill. *Hexand. Monog. Liliaceæ. Radix. South of Europe.*

Squill is the bulbous root of a plant which grows on the sandy shores of Spain and Italy. It varies in size, and consists of concentric layers easily separable, each covered with a thin membrane, of a white or purplish colour. It has little smell; its taste is bitter and acrid, and it is capable of inflaming the skin: its acrimony is lessened by drying; but its bitterness and active powers as a medicine are little impaired. In drying, it loses about four fifths of its weight. Its active matter is extracted by water, alcohol, and vinegar. The latter is the solvent commonly employed, as it best covers its nauseous taste, and does not appear to injure its powers.

From an analysis by M. Vogel, its virtues seem to reside in an acrid principle which he calls Scillitin. He states the proportions of its constituents as follows:—Gum, 6. scillitin, 35. tannin, 24. woody fibre, 30. with some traces of citrate of lime and sugar. It is white and transparent, with a resinous fracture; taste very acrid. It absorbs water from the atmosphere, and is easily soluble in water. Alcohol dissolves it more readily when hot.

Squill, given in a sufficient dose, excites vomiting, though it is seldom used with that intention in substance. The vinegar of squill acts as an emetic in a dose of 2 or 3 drachms, as does the syrup when given in double that quantity; either of them is sometimes prescribed in pertussis; the syrup, in particular, from its sweetness, being easily given to children: and some advantage, it is supposed, being derived from the combination of its expectorant with its emetic power. The dose is a drachm to a child below five years of age, and its activity is promoted, so that its operation is more certain, by the addition of a little ipecacuan wine. This root is, however much more used as a diuretic and expectorant; uses of it which are afterwards to be noticed.*

Offic. Prep.—Acet. Scill. Mar. Pil. Scill. Tinct. Scill. *Ed. Lond. Dub.* —Syr. Scill. Marit. *Ed.*

Anthemis Nobilis. Chamomile. (See page 144.)

All bitter drugs are liable to excite nausea or vomiting. Chamomile has perhaps more peculiarly this effect; a strong infusion of the dried flowers in warm water excites vomiting, and a weaker infusion is often employed to quicken the action of ipecacuan or other emetics, a draught of it being taken instead of tepid water.

Sinapis Alba. Mustard. *Tetradyn. Siliq. Siloquosæ. Semen. Indigenous.*

The seeds of mustard have a considerable degree of acrimony and pungency, which is apparent when they are bruised. This has been supposed, but without much certainty, to reside in an essential oil. They yield a portion of mild oil by expression, and the acrid matter remains with the fecula, which is the base of the seed.

The powder of the mustard seed, given in the dose of a large tea-spoon-

* *Incompatible Substances.* Alkalies diminish their acrimony and bitterness, and are probably medically inconsistent with their diuretic qualities; vegetable acids produce no effect upon their *sensible* qualities, but are said to increase their expectorant power. Paris. *Ed.*

ful mixed with water, operates as an emetic. From its stimulant quality, it has been recommended in preference to other emetics in apoplexy and paralytic affections, and in such cases has sometimes been found to excite vomiting when these had failed. It is convenient also as an auxiliary, when the dose of an emetic has not operated, a little of the powder of mustard being taken diffused in tepid water. The seeds unbruised are sometimes swallowed in the dose of half an ounce or an ounce, as affording a stimulant in chronic rheumatism and amenorrhœa. The flour of mustard is applied externally as a rubefacient and vesicatory.

Offic. Prep.—Catap. Sinapeos. *Lond. Dub.*

Asarum Europæum. Asarabacca. *Dodecand. Monogyn. Sarmentaceæ. Folia. Indigenous.*

The leaves and root of this vegetable, prior to the introduction of ipecacuan, were frequently employed on account of their emetic quality; the dose of the dried leaves was 20 grains; of the dried root, 10 grains. As they were occasionally violent in their operation, and at the same time uncertain, they have fallen into disuse. The plant is still retained in the Materia Medica as an errhine.

Nicotiana Tabacum. Tobacco. (See page 98.)

The leaves of this plant, in a person unaccustomed to their use, by chewing or smoking, excite, even in a small dose, severe and permanent nausea and vomiting. The same effects have followed from their external application to the region of the stomach; and this method of exciting vomiting has been proposed to be employed in cases where emetics cannot be easily administered by the mouth. Tobacco is also sometimes taken under the form of infusion as an emetic, but its operation is always harsh, and accompanied with severe sickness.

[Lobelia Inflata. Indian Tobacco—Emetic Weed. *Pentand. Monogyn.* Nat. Ord. *Campanaceæ. United States. Herba.*

This plant is to be found in every part of the United States, and flowers in the months of June and August. Its taste is acrid, resembling very much that of tobacco. It yields its virtues both to water and alcohol. According to the analysis of Bigelow, it contains, 1. An acrid principle. 2. Caoutchouc. 3. Extractive.

Its effects upon the human system are different according to the doses in which it is given. Taken in large quantities, it has been known to be succeeded by consequences the most violent, and even fatal. As it bears a close affinity in its general operation to tobacco, its administration should therefore be subjected to the same cautions which are found necessary in the use of this latter article. In suitable doses the Lobelia acts as an antispasmodic, emetic, expectorant, and diaphoretic.

In the treatment of asthma, its virtues have received the highest commendation. The Rev. Dr. Cutler, to whom we are indebted for our earliest information on this subject, used it in his own case, with the most decided success, and his reports concerning it have been confirmed by subsequent observations. By Dr. Eberle it has been administered with success in croup, as also in a case of strangulated hernia, in the form of enema. In the hands of Dr. Barton, it has proved successful in hooping cough, and in general it is recommended as a valuable expectorant in catarrh, and in coughs depending upon an accumulation of fluids in the bronchial vessels.

The proper season for collecting the plant is the month of August. The whole plant should be taken up by the roots and then dried. It may be given in substance from 10 to 30 grains, as an emetic for an adult. To prove expectorant it must be administered in small repeated doses. The best preparation is the tincture, which may be made either from the recent or dried plant. The former is supposed to be the most active. In the Pharmacopœia of the United States, it is prepared by digesting for ten days ℥ij of the plant in one pint of diluted alcohol. The dose is from ʒi to ʒiv, according to the effects intended to be produced. B.]

[Euphorbia Ipecacuanha. American Ipecacuanha. Spurge. *Dodecand. Trigyn.* Nat. Ord. *Tricoccæ. United States. Radix.*

This species of the Euphorbia is peculiar to the United States, and is found in loose sandy soils along the sea-coast from New-Jersey to Georgia. It flowers in May. The root, which is used in medicine, is perennial, and has a sweetish and not unpleasant taste. According to analysis it contains caoutchouc, resin, mucus, and probably fecula. As an emetic the American Ipecacuanha stands exceedingly high with those who have made the most extensive trials of its virtues. Dr. Barton eulogizes it as abundantly competent to supersede the common ipecacuanha of the shops. In some respects he considers it even superior. It may be used in every case in which the foreign ipecacuanha is indicated. The dose is from 15 to 20 grains. B.]

[Spiræa Trifoliata. Indian Physic. Ipecacuanha. Beaumont Root. *Icosand. Pentagyn.* Nat. Ord. *Lenticosæ. United States. Radix.*

This plant flourishes in all parts of this country, and is found resident in shady woods on mountains and hills. The root is the only part used in medicine. It has a bitter taste, and on analysis yields large proportions of extractive matter and resin. As an emetic the spiræa enjoys the reputation of possessing properties nearly equal to those of the ipecacuanha. The dose is xxx grs. in powder. The proper period for gathering the root is September. B.]

CHAP. VIII.

OF CATHARTICS.

Cathartics are those medicines which quicken or increase the evacuation from the intestines; or which, when given in a certain dose, produce purging. They are medicines of importance, but differ from each other very considerably in their powers.

Cathartics evidently act by stimulating the intestines so as to increase the natural peristaltic motion, and thus cause their contents to be more quickly propelled and evacuated. The greater number of them have, however, a farther effect. They stimulate the extremities of the exhalent vessels, terminating on the inner surface of the intestines: they thus cause a larger portion of fluid to be poured out, and hence the evacuations are more copious, and of a thinner consistence. Some cathartics have this

power of increasing the effusion of fluids from the exhalents much more than others; such, for instance, are the Saline Purgatives. Dr. Cullen has even supposed that some may act solely in this way, and without increasing directly the peristaltic motion. There is, however, no proof of this; and it seems scarcely probable that a substance should act as a stimulant on these vessels, without at the same time stimulating the moving fibres of the intestines. Some seem to produce the latter effect with scarcely any of the former; such are aloes and rhubarb; hence they merely increase the natural discharge.

The action of cathartics is not confined to the parts to which they are directly applied. Their stimulus is extended to the neighbouring organs, probably by sympathetic communication, and hence they promote the secretion, and increase the discharge of the bile and other fluids poured into the intestinal canal. These effects are produced in very different degrees by different cathartics, and there seems some reason for admitting an opinion adopted by the ancients, that certain carthartics have peculiar powers in this respect; some, for instance, having the power more particularly of promoting the discharge of bile, others that of the mucus of the intestines, or of the serum; it is not improbable, as Darwin imagined, that the pancreas and spleen may be peculiarly stimulated into action, by others of this class of medicines: and the action of some of them has also been supposed to be extended to the uterine system.

There is likewise a difference in cathartics with respect to the parts of the intestinal canal on which they act. Some, as the saline purgatives, seem to increase its peristaltic motion through its whole length; others, as aloes, have their action confined to the lower intestines.

Lastly, it is to be observed, that the action of many cathartics is extended even to the stomach; its peristaltic motion is increased, either from association with the motion of the intestinal canal, or from the direct stimulant action of the cathartic applied, and its contents are therefore more quickly discharged by the pylorus. From this cause, a full dose of a saline purgative will sometimes operate in half an hour after it is given.

There are several other differences between the medicines belonging to this class: some act slowly; others more quickly: some are liable to occasion nausea and griping, and in a large dose tenesmus; others, even when they operate effectually, are free from these disagreeable effects: some produce only one evacuation, others continue to act for a considerable time.

Besides the differences between particular cathartics, a general difference in their mode of operation has been supposed to exist, from which they have been classed under two divisions. Some operate mildly, without exciting any general affection of the system, without even stimulating perceptibly the vessels of the intestines, and hence they merely evacuate the contents of the canal. Others are more powerfully stimulant: they occasion an influx of fluids from the exhalent vessels, and from the neighbouring secreting organs: they even extend their stimulant effect to the system in general, and if taken in too large a dose are liable to excite much irritation, and even inflammation on the surface of the intestines. The former are distinguished by the title of Laxatives, the latter are named Purgatives, and the stronger of them, Drastic Purgatives. The distinction is not altogether correct, since it refers merely to a difference in power: yet neither is it one to be altogether neglected.

From the indications which cathartics are capable of fulfilling, their utility in many cases of morbid affection must be obvious. In some general affections of the system, they procure a speedy, copious, and therefore useful depletion. And wherever there exists retention of the contents of the intestinal canal, where these contents are acrid, or where extraneous bodies are present, the evacuation by the operation of a cathartic is the obvious method of treatment.

The valuable observations of Dr. Hamilton have established still more clearly the importance of this class of remedies, have shewn that they admit of more extensive application, and have pointed out with more precision the principles which regulate their administration.

In many diseases, there exists a state of the intestinal canal giving rise to retention of its contents, which is not to be obviated by the occasional administration of a cathartic, but which requires a continuation of the operation short of that of purging, but producing evacuation while the contents are peculiarly offensive, or of an unnatural appearance, and until the healthy state of the bowels be restored. By this practice the cure of diseases has been accomplished, which previous to Dr. Hamilton's publication, were treated by very different methods, and were not supposed to be so peculiarly connected with any state of the alvine evacuation.

Thus in fever, the peristaltic motion of the intestines is diminished; the fœculent matter is retained, and becomes a source of irritation; its evacuation, therefore, by the exhibition of purgatives, is clearly indicated, nor has this been altogether neglected. Physicians, however, were scarcely aware of the necessity of producing it to a sufficient extent; and in fevers of the typhoid type in particular, were frequently deterred from doing so by the fear of reducing the strength of the system by an evacuation considered as debilitating. Dr. Hamilton's observations establish the safety and propriety of the freer use of purgatives in fever, so as to produce complete and regular evacuation of the bowels through the whole progress of the disease; and the cases he has published afford striking proofs of the advantages derived from the practice. There are forms of fever in which it is employed with equal advantage, and particularly so in scarlatina.

Several of the diseases comprehended under the class Neuroses appear to depend on, or to be very intimately connected with a torpid state of the intestines, from which an accumulation of their contents takes place, proving a source of irritation that often affects the general system. Chorea is proved by Dr. Hamilton's observations to arise from this cause; and he has introduced with great success the mode of treatment, by the free use of purgatives, continued until the healthy state of the alvine evacuation has been established. The success of this method has indeed been such that scarcely any other is employed, and a disease formerly regarded as one of the most obstinate, is now more under the power of the physician. The same practice, and with similar success, applies to hysteria, and, in Dr. Hamilton's opinion, to that species of tetanus, which, prevailing in warm climates and in warm seasons, appears to have its origin in disorder of the stomach and bowels And ample evidence has established the success of the samet reatment in the marasmus which attacks the young in both sexes, which is marked by loss of appetite, weakness, wasting of the body, and at length total prostration of strength. It is not less successful in chlorosis, and in that hæmatemesis to which females are liable between eighteen and thirty years of age. In some of these diseases, the quantity of matter

accumulated in the intestines is extremely great; hence the extent to which the exhibition of purgatives must be carried, and the length of time during which they must be continued, much exceed what would be calculated on from the usual administration of remedies of this class; and the whole practice requires both decision and perseverance.

Analogies from some of these diseases lead to a similar exhibition of cathartics in other fevers, particularly in the bilious remitting fever of warm climates, in measles, erysipelas, and small-pox; likewise in scrofula, in dyspepsia, whether simple, or complicated with hysterical or hypochondriacal mania; in cramp of the stomach, or of the extremeties; in palpitation of the heart, and in those cases of hydrophobia which are not the effect of specific contagion. With regard to several of these, experience has established the soundness of the analogy.

In cholic, and in ileus, the exhibition of cathartics is required, though there is considerable caution necessary in their application, to avoid such irritation as would excite or increase inflammation. In dysentery, similar advantages are derived from them, and still more caution is requisite to lessen the irritation they are liable to induce. The milder active purgatives are therefore employed.

Cathartics are farther employed with other intentions than merely to evacuate the intestinal canal. From the effusion of serous fluid which they occasion, by their stimulant action on the exhalent vessels, they are supposed to produce a diminution of fluids with regard to the whole body. This is in some measure an abstraction of the usual exciting powers acting on the system, and hence purging constitutes a part of what is named the Antiphlogistic Regimen, and is employed in inflammatory affections. By a similar operation, it increases absorption. There exists a certain relation between the exhaling and absorbing powers, so that when the action of the one is increased, that of the other is augmented: the increased exhalation of serous fluid, therefore, into the intestines, which cathartics occasion, causes an increased absorption; and thus dropsy is sometimes cured by purging. It is evident that those cathartics which stimulate the exhalent vessels of the intestines are best calculated to fulfil this indication; hence saline purgatives are in general most serviceable in dropsy.

From the serous evacuation which cathartics occasion, from the derivation which they make from the head, and partly, no doubt, by removing a source of irritation, they are of utility in preventing and removing apoplexy; in all comatose affections, in mania, phrenitis, and the different species of headach.

Cathartics, especially the more powerful ones, require to be administered with caution even in diseases where they are indicated, when there is any tendency to inflammation or to extreme debility; also during pregnancy, immediately after delivery, during the flow of the menses, and in those liable to hæmorrhoidal affections. The too frequent use of them induces wasting of the body, and sometimes renders the intestines morbidly irritable, so that purging is easily excited, while in other habits it renders them more torpid, and induces costiveness. The saline cathartics have more peculiarly the former effect, and more quickly reduce the strength of the body, probably by the evacuation they occasion from the circulating mass.

Some cautions are requisite with respect to the mode of administering cathartics. Many of them are liable to excite nausea or vomiting,—effects which are prevented by giving them at intervals in repeated doses, or often by combining them with an aromatic. Such a combination also obvi-

ates the griping which they often occasion. The more acrid cathartics ought always to be given in divided doses: as in certain habits, even a small dose is liable to occasion unpleasant symptoms. In general also, these acrid cathartics ought to be given rather in combination, as the effect is obtained with more certainty. Colocynth, or scammony, or any other drastic purgative, may fail if given alone in such a dose as it is proper to venture on; but if smaller doses of two or three of them be mixed, their operation is more certain and easy. Mercury always promotes the action of cathartics, and this effect is obtained not only by the internal exhibition of purgative mercurials, but by the introduction of mercury by friction; it is therefore a general effect and is employed, with peculiar advantage in obstinate constipation. Another advantage derived from the combination of cathartics is that the more peculiar effect of each, whether it be evacuating the larger intestines, or stimulating the exhalent vessels, and causing the effusion of fluid, is prevented, and the general effect, exclusive of these peculiarities, is better obtained. They irritate less when given in a liquid form; in that form too they act more speedily than when given in a solid state; hence, when it is wished that a cathartic should operate slowly, it is best given in the form of pill, and at bed-time, as the state of diminished susceptibility in sleep retards the operation. In general, however, it is preferable to give the dose of a cathartic in the morning, as the operation of it is less troublesome to the patient. Dr. Hamilton has pointed out the common error in the exhibition of cathartics, that of their not being given to the requisite extent; and has given the general rule in all morbid affections, of repeating, and, if necessary, enlarging the dose while the evacuations are peculiarly offensive, or of an unnatural appearance, without however carrying their administration so far as to produce purging, unless this be the indication which is designed to be fulfilled.

Cathartics may be arranged in some measure according to their power, placing those first which operate mildly, and which have usually been denominated Laxatives, and proceeding to those which are more powerful, and have other effects than merely evacuating the contents of the canal. The Saline Cathartics may be placed under the latter division, though their operation, as has been already explained, is sometimes peculiar. To this may be added those substances which act as cathartics under the form of Enema.

CATHARTICS.

A.—LAXATIVES.

Manna.	Sulphur.
Cassia Fistula.	Magnesia,
Tamarindus Indica.	Carbonas Magnesiæ.
Ricinus Communis.	

B.—PURGATIVES.

Cassia Senna.	Rhamnus Catharticus.
Rheum Palmatum.	Aloe Perfoliata.
Convolvolus Jalapa.	Convolvolus Scammonia.
Helleborus Niger.	Stalagmitis Cambogioides.
Bryonia Alba.	Sub-murias Hydrargyri.
Cucumis Colocynthis.	Sulphas Magnesiæ.
Momordica Elaterium.	Sulphas Sodæ.

Sulphas Potassæ.
Super-tartras Potassæ.
Tartras Potassæ et Sodæ.
Phosphas Sodæ.
Murias Sodæ.

Terebinthina Veneta.
Nicotiana Tabacum.

LAXATIVES.

MANNA. Manna. Fraxinus Ornus. Fraxinus Rotundifolia. *Polygam. Dioec. Ascyroid. Succus concretus South of Europe.*

THIS substance, though afforded by several vegetables, is usually obtained from different species of the ash tree, particularly those mentioned above, which are cultivated in Sicily and Calabria. It is procured by spontaneous exudation, but more copiously by incisions made in the bark of the trunk. The juice, which exudes, soon becomes concrete. When it exudes slowly, the manna is more dry and white, and of a texture somewhat granulated; it is collected in chips of wood or straw, and forms what is named Flake Manna. When the exudation is more copious, the juice is of a darker colour, and concretes into a soft mass, less pure than the other, and composed of fragments of a grey and white colour intermixed.

Manna has a sweet, though somewhat unpleasant taste, and possesses the general chemical properties of saccharine matter; it is entirely soluble in water and alcohol. The chemical difference between it and pure sugar is not very well established. When dissolved in alcohol, with the aid of heat, the solution on cooling deposites crystals apparently purely saccharine; and by concentration of the residual liquor, a mucilaginous extractive matter remains not crystallizable, having the peculiar taste of the manna. Although sugar in its unrefined state proves laxative, manna does so in a greater degree.

The dose of manna, as a laxative, is from one to two ounces to an adult, but it scarcely operates with sufficient effect to admit of being employed alone. Though mild in its operation, it is apt too to produce flatulence and griping, and hence it is principally used in combination with other cathartics, particularly with senna, the bitter taste of which it covers. This combination is in common use as a purgative to children.

Offic. Prep.—Syrup. Mannæ. *Dub.*

CASSIA FISTULA. Purging Cassia, or Cassia in pods. *Decand. Monog. Lomentaceæ. Fructus; Pulpa Fructus. Egypt; East and West Indies.*

THE fruit of this tree is in cylindrical pods, nearly an inch in diameter, and ten or twelve inches in length. The external membranous part is firm and hard; it is divided within by septa, between which the seeds are inclosed, imbedded in a soft pulp. The pulp is of a black colour, and has a sweet taste, with a slight degree of acidity. It is extracted by boiling the bruised pods in water, and evaporating the decoction. It is soluble in water. According to Vauquelin's analysis of it, it contains, besides the fibrous part, gluten, jelly, mucilage, and saccharine matter.

The pulp of cassia proves laxative in a dose of four of six drachms; in a large dose necessary to occasion purging, it is apt to induce nausea or griping, and even as a laxative it has no particular advantage. The sole consumption of it is in the composition of the officinal preparation the Sen-

na Electuary. There is another electuary in the Pharmacopœias, to which, as being the principal ingredient, it gives its name, in which it is combined with manna and pulp of tamarinds, but this is never used.

Offic. Prep.—Elect. Cass. Fist. *Ed. Lond. Dub.*

Tamarindus Indica. Tamarind. *Monadelph. Triand. Lomentaceæ. Fructus conditus East and West Indies, America, Arabia.*

The pod of this tree includes several large hard seeds, with a brown viscid pulp, very acid. The pulp, mixed with the seeds and small fibres, and with a quantity of unrefined sugar added to preserve it, forms the Tamarinds of the shops, the preparation of them being performed in the West Indies, by freeing the pod from its external covering, and pouring on the pulp and seeds, a strong syrup hot, so that on cooling it becomes nearly concrete. Vauquelin found this prepared fruit to contain, besides the sugar mixed with it, citric and malic acids, super-tartrate of potash, tartaric acid, jelly, mucilage, and fibrous matter. The citric acid is in largest quantity, about an ounce and a half being obtained from a pound of the pulp.

The pulp of tamarinds, besides its virtues as an acid, proves laxative, when taken to the extent of an ounce, or an ounce and a half, but is too weak to be employed alone. It is generally added to other cathartics, which are given in the form of infusion, with the view of promoting their operation, or of covering their taste. It is an ingredient in the Electuarium Sennæ, and there is an officinal infusion of it with senna, which affords a very pleasant purgative. An infusion of it in warm water forms, when cold, a grateful refrigerant beverage.

Offic. Prep.—Infus. Senn. Composit. *Ed. Dub.*

There are some other sweet fruits which have a laxative quality, as the Fig (Ficus Carica,) and the Prune (Prunus Domestica.) These are sometimes used in domestic practice, and they are also ingredients in the Electuary of Senna.

Ricinus Communis. Palma Christi. *Monoec. Monadelph. Tricoceæ. Oleum ; Semen. West Indies.*

The seeds of the capsules of this plant are farinaceous, with a considerable quantity of unctuous matter intermixed. They afford, by expression or by decoction, an oil which is used in medicine in this country under the name of Castor Oil. When obtained by decoction of the bruised seeds in water, it is purer and less acrimonious than when obtained by expression. It is of a yellowish colour, transparent, viscid, and has scarcely any peculiar taste or smell : it has the general properties of expressed oil : but what is singular, it is soluble in alcohol. It is the only example of an expressed oil having any medicinal activity.

As a laxative, castor oil acts mildly, and, at the same time, very effectually ; it also operates in a shorter time than almost any other cathartic. Possessed of such advantages, it is frequently employed ; and is more peculiarly adapted for exhibition, where any degree of irritation is to be avoided ; hence its use in colic, constipation, hæmorrhoids, and as a purge during pregnancy. Its dose is one ounce. It is taken floating on peppermint-water ; mixed with any spiritous liquor, or any purgative tincture, as that of senna ; or diffused in water by the medium of gum, sugar, or the yolk of an egg.

From the Mineral kingdom, two laxatives are derived, Sulphur and Magnesia.

Sulphur is a simple inflammable, found in nature nearly pure, and likewise in combination with several of the metals. The greater part of the sulphur of commerce is the produce of volcanic countries. It is naturally mixed with earthy matter, from which it is freed by sublimation, forming the Sulphur Sublimatum. Flores Sulphuris, or Flowers of Sulphur. When melted and run into cylindrical molds, it forms Roll Sulphur, which is usually less pure.

Sulphur, in its solid state, is brittle and hard, but it is capable of assuming a crystalline form; it is generally used in the state of the loose powder in which it is obtained by the process of sublimation conducted on a large scale. It is of a light yellow colour; is insipid, or slightly sour from a small portion of acid adhering to it; it has a faint smell when rubbed or heated: is fusible and volatile; and when heated in atmospheric air, burns with a blue flame, and the production of suffocating fumes. It is insoluble in water or alcohol, but is dissolved by oils, and combines with the alkalis, several of the earths, metals, and metallic oxides.

Sulphur, in a dose of 2 or 3 drachms, acts as a laxative, and so mildly, that it is often used in hæmorrhoidal affections, and in other cases where, though the operation of a purgative is indicated, any irritation would be injurious. It likewise passes off by the skin, and is hence administered internally, as well as applied externally in psora. In this disease it may be regarded as a specific. In habitual dyspnœa and in chronic catarrh, advantage has been derived from it, partly from its action as a laxative, and partly as a diaphoretic. The solution of it in oil has been used in these cases, but this preparation is both acrid and extremely nauseous. Sulphur is best given in the form of electuary. The purification of Sulphur by washing is ordered in the Pharmacopœias, but is a process unnecessary. Precipitated by an acid from its solution by an alkali or lime, it is obtained of a whiter colour than in its usual state, and this precipitated sulphur is used in preference to the sublimed sulphur in forming ointments. The combination of it with potash, Sulphuretum Potassæ, has also been introduced into the Pharmacopœias, principally with the view of affording a substance which has been supposed capable, by its chemical action, of counteracting the operation of metallic preparations where these have been taken in excess.

Offic. Prep.—Sulph. Sublimat. Sulph. Potass. Sulphur Lotum. Ol. Sulph. Ung. Sulph *Ed. Lond. Dub.*—Sulph. Præcipit. Unguent. Sulph. Compos. *Lond.*

Magnesia. Magnesia. Carbonas Magnesiæ.

This earth is not found pure in nature, but exists abundantly combined with certain acids, and from these saline combinations, particularly from the sulphate and muriate extracted from sea-water, it is obtained by processes to be afterwards noticed, either pure, or in the state of carbonate. In either state, it is used as an antacid and laxative, in a dose of a drachm or more. Its laxative effect is generally considered as owing to its forming with the acid in the stomach a saline combination, which, like its other salts, is purgative, though as it usually produces this effect, it probably

has itself a weak cathartic quality. From being insipid and mild, it is well adapted for exhibition to infants.*

PURGATIVES.

Cassia Senna. Senna. *Decand. Monog. Lomentaceæ. Folia. Egypt, Arabia.*

The dried leaves of this plant are of a yellowish-green colour, have a faint smell, and a bitter taste. Their active matter is extracted by water and by alcohol by infusion. By decoction with water, its strength is impaired

Senna is a purgative very frequently employed, having a considerable degree of activity, without being liable to be harsh in its operation. It is usually given in the form of the watery infusion, 2 drachms being infused in 4 or 6 ounces of tepid water, generally with the addition of a few coriander seeds, or a little ginger, to cover its flavour, and obviate griping, which it has rather a tendency to produce. It is also frequently combined with manna, with tamarinds, or with super-tartrate of potash; and as its taste can be covered by sugar or manna, it is a purgative generally given to children. There is an officinal tincture of it which operates as a purgative in the dose of an ounce; there are also officinal infusions of it; and it enters into the composition of several other preparations employed as cathartics.

Offic. Prep.—Elect. Senn. C. Extr. Cass. Senn. Inf. Tam. Ind. cum Cass. Sen. T. Cass. Senn. C. *Ed.*—Inf. Senn. Pulv. Senn. C. *Lond.*—Syrup. Senn. Tinct. Sennæ. *Lond. Dub.*

Rheum Palmatum. Rhubarb. *Enneand. Trigyn. Oleraceæ. Radix. Tartary.*

Besides the Rheum Palmatum, two other species, the Rheum Undulatum, and Rheum Compactum, are cultivated with the view of obtaining their roots to be used in medicine; nor is any considerable difference to be observed between the root obtained from any of them when it is properly dried and preserved. The best rhubarb is that named Russian or Turkey; it is the produce of Tartary; is in small pieces, with a large hole in the middle, this perforation having been made in the recent root to admit of its drying more quickly; it is of a lively yellow colour, with streaks of white and red; has a smell peculiar, and somewhat aromatic; and a bitter slightly astringent taste. Another kind is imported from China, and is known in the shops by the name of Indian Rhubarb; it is in larger masses, more compact and hard, heavier, and less friable and less fine in the grain than the other, and having less of an aromatic flavour. Rhubarb, cultivated in this country, has been prepared equal to either of the others; but in general it is inferior, probably from less care being bestowed on its cultivation and preparation.

The active principles of rhubarb are not very well ascertained. It was lately analysed by Mr Brande, who states its composition as follows: water 8.2, gum 31.0, resin 10.0, extract, tannin, gallic acid 26.0, phosphate of lime 2.0, mulate of lime 6.5, woody fibre 16.3=100.0. It is some-

* *Incompatible Substances.* Acids and acidulous salts; alkalies and neutral salts; alum; cream of tartar, nitrate of silver, acetate of mercury, oxymuriate of mercury, super-acetate of lead, sulphates of zinc, copper, and iron. Paris. *Ed.*

what mucilaginous, and yields part of its powers to water by infusion. Alcohol likewise dissolves a considerable proportion of it; and diluted alcohol appears to be its most perfect solvent, dissolving all its active matter. It has been supposed to have the combination rather singular, of an astringent with a cathartic power. The watery infusion is said to be more purgative than the spiritous, and by applying heat to the rhubarb in substance, its purgative quality is lessened, while its astringency remains. The Chinese rhubarb is supposed to be more astringent than the Turkey. The astringency of rhubarb is not, however, very sensible in its medicinal operation, and has perhaps rather been inferred from the effects of chemical re-agents. Every kind of it contains a quantity of earthy matter, chiefly lime, combined with sulphuric and citric acids, forming the principal part of the white streaks. This is more abundant in the Turkey rhubarb than in the others.

The dose of rhubarb as a cathartic is one scruple or half a drachm. A dose such as this appears to be necessary to produce the full purgative effect; but a much smaller quantity, that of a few grains, is sufficient to excite the action of the intestines, so as to produce increase of the natural evacuation, and it is with this last intention, perhaps, that it is most properly employed. It is useful in this mode in dyspepsia, hypochondriasis, jaundice, and some similar affections, obviating the costiveness which frequently attends them, and further, by its operation as a bitter, contributing to restore the tone of the digestive organs. From its supposed astringent property, it has been considered as peculiarly adapted for exhibition in diarrhœa, any acrid matter being evacuated by its purgative effect, before it acts as an astringent. It farther enters into a number of officinal preparations, in which it is either the principal medicine, or combined with aloes, which bears a considerable resemblance to it in its modes of operation, with bitters, or aromatics.

Offic. Prep.—Inf. Rhei P. T. Rhei P. *Ed. Lond. Dub.*—Vin. Rhei. T. Rhei Comp. Tinct. Rhei et Gent. Pil. Rhei C. *Ed.*—Tinct. Rhei, C. Extr. Rhei, *Lond.*

CONVOLVULUS JALAPA. Jalap. *Pentand. Monogyn. Campanaceæ. Radix. Mexico.*

THE dried root of jalap is imported in thin transverse slices, or in round masses; it is solid, hard, and heavy; of a dark grey colour, and striated texture. It has little smell; its taste is bitter and subacrid.

Jalap contains a resinous and a gummy matter, its purgative quality appearing to reside in the former, as it is extracted by alcohol, while its watery infusion is comparatively inert. Proof-spirit is its proper menstruum.

This root is an active purgative, producing full evacuation from the intestines; sometimes occasioning, however, nausea or griping. Its medium dose is half a drachm. Besides being given alone, it is very frequently used to quicken the action of other cathartics, of calomel, for example; or it is combined with others, which are supposed to render it less stimulating, as with the super-tartrate of potash. This latter combination is in common use as a hydragogue cathartic; the former, that of jalap and calomel, affords a very safe active purgative, which is employed where it is difficult to excite the action of the intestinal canal. Jalap operates most mildly and effectually in substance, and is therefore seldom given under any form of preparation.

Offic. Prep.—T. Conv. Jalap. Extr. Conv. Jalap. *Ed. Lond. Dub.*—Pulv. Jalap. C. *Ed.*

HELLEBORUS NIGER. Melampodium. Black Hellebore. *Polyand. Polygn. Multisiliquæ. Radix. Austria, Italy.*

THE root of this plant consists of short articulated fibres attached to one head, externally dark-coloured, internally white. Its taste is very acrid, but the acrimony is much impaired by drying and by age. Its active power seems principally to reside in an oil obtained by digesting the root in alcohol, also in its resinous part which alcohol dissolves, the tincture affording, by evaporation, a very active extract. By decoction with water it yields half its weight of gummy matter, with some resin ; and the extract obtained by inspissation of this, is milder than the spiritous extract, and milder even than the root itself. Its distilled water, it is affirmed, is acrid, and even cathartic.

Black hellebore root is a very powerful cathartic in a dose of a few grains ; so violent, indeed, and at the same time uncertain in its operation, that it is scarcely ever used in substance ; the watery extract of it, which is milder, has sometimes been employed. On its cathartic power probably depends any advantage that may be derived from its administration in mania and melancholia, in which diseases it was highly celebrated by the ancients. In dropsy it has been employed as a hydragogue cathartic, principally under the form of the spiritous extract. It was likewise recommended by Mead as an emmenagogue, in the form of tincture, but with others has seldom been successful.

Offic. Prep.—T. Helleb. N. *Ed. Lond. Dub.*—Extr. Helleb. *Ed. Dub.*

BRYONÍA ALBA. Bryony. *Monoec. Syngenes. Cucurbitaceæ. Radix. Indigenous.*

THE root of this plant, when recent, is highly acrid ; by drying it becomes milder. In a dose of 20 grains of the dried root, it acts as a strong cathartic, and generally also as a diuretic. It is, however, somewhat uncertain, and liable to be violent in its operation, and is therefore little used.

CUCUMIS COLOCYNTHIS. Colocynth. *Monoec. Syngenes. Cucurbitaceæ. Fructus Pulpa. Syria.*

THE part of this plant used in medicine is the dried medullary substance of the fruit. It is white, soft, and porous ; the seeds mixed with it are comparatively inert. Its taste is intensely bitter. Boiled in water, it gives out a large portion of mucilage, so as to form a liquor of a gelatinous consistence. This is less active than colocynth itself. Alcohol also dissolves only part of its active matter.

Colocynth is one of the most drastic purgatives, so much so that its operation is not easily regulated. Its dose is from 3 to 6 grains, but it is so liable to occasion griping, tenesmus, and other symptoms, that it is scarcely ever given by itself, being rather used to promote the operation of other cathartics. Combinations of it with jalap, aloes, or mild muriate of mercury, are thus given in obstinate constipation, in mania, and coma ; and in these combinations it operates more mildly and more effectually than if given alone. Its infusion has been recommended as an anthelmintic.*

Offic. Prep.—Pil. Aloes cum Colocynth. *Ed. Dub.*—Extr. Colocynth. *Lond.*—Extr. Colocynth. Comp. *Lond. Dub.*

MOMORDICA ELATERIUM. Wild Cucumber. *Monoec. Syngenes. Curcubitaceæ. Fecula Fructus. South of Europe.*

* *Incompatible Substances.* Sub-acetate and acetate of lead, nitrate of silver, sulphate of iron, and the fixed alkalies. Paris. *Ed.*

The expressed juice of the fruit of this plant deposites a fecula, which, when dried, has been known by the name of Elaterium. It is a very powerful cathartic, and from the violence of its operation has been ventured to be exhibited only in the most obstinate cases. Its dose is half a grain, repeated every second or third hour, till it operates. As a drastic purgative, it has sometimes been given in mania, and as a hydragogue cathartic in dropsy.

The principal objection to the employment of this powerful medicine, is the uncertainty of its action. It has been given to the extent of ten grains with scarcely any effect upon the intestinal canal; and in other cases, the small dose of half a grain has acted as a most powerful cathartic. The reason of this diversity of effects, has been very clearly shown by Dr. Clutterbuck to arise from the different plans that have been adopted in procuring the medicine; those that prepared it taking it indiscriminately from the stalks, leaves, roots, &c.

The different parts of the plant were submitted to analysis by Dr. Clutterbuck, and he found them to possess different degrees of cathartic power. From these he inferred, that the most active principle of the plant did not belong to any of those particular parts he analysed; but he found it to reside in the juice around the seeds. This juice, he states, is perfectly colourless, and limpid when it first exudes; but after some time, it assumes a turbid appearance, and deposites a sediment of a yellowish-white colour. This is the real elaterium, and when dry, it is light and pulverulent. Its taste is acrid, it is insoluble in water, and appears, from its solubility in alcohol, to be of a resinous nature. The extract presenting the appearance of a resin, is obtained from it dissolved in spirit, possessing very great activity as a medicine, the sixteenth part of a grain being followed by purging, and not unfrequently vomiting. One eighth of a grain is a powerful dose, perhaps too much so, as its effects are rather violent. The following is the plan he adopted in procuring the elaterium:—"The cucumbers should be gathered when as nearly ripe as possible, and without violence, that might endanger their bursting. They should then be wetted by the affusion of cold water, that less of the juice, when they are cut, may adhere to the external surface. In this state, they should be cut through longitudinally, and the juice allowed to strain through a fine sieve, placed in a large earthen-ware vessel. The seeds and surrounding pulp should be scooped out upon the sieve, and washed with repeated affusions of cold water, by which they will be freed from all adhering juices."

"After standing a few hours, a sediment is formed, from which the clear liquor is to be poured off; it is then to be thinly spread on fine linen, and exposed to the air to dry: a gentle warmth may be employed without injury; but the access of sunshine destroys the fine green colour which the substance otherwise acquires."

Offic. Prep.—Extract. Elater. *Lond.*

Rhamnus Catharticus. Buckthorn. *Pentand. Monogyn. Dumosæ. Baccarum Succus. Indigenous.*

The berries of this vegetable are very succulent; the juice they afford by expression has a cathartic power. Made into a syrup by boiling with sugar, it operates in a dose of an ounce. It is liable, however, to occasion thirst and griping, and is therefore seldom used.

Offic. Prep.—Syr. Rhamn. C. *Ed. Lond.*

Aloe. Aloe Socotorina. Aloe Barbadensis. Aloes Socotorine, and Barbadoes. Aloe Perfoliata, et Spicata. *Hexand. Monogyn. Liliaceæ. Succus spissatus. Africa. Asia. America.*

Aloes is a concrete resinous juice. Several varieties of it are met with in the shops, which differ in purity, and in their sensible qualities. The Socotorine, originally brought from the African Island of Socotora, is considered as the purest. It is in small pieces of a reddish-brown colour, nearly black in the mass. The Barbadoes aloes is of a lighter colour, and has an odour stronger and more unpleasant. It is also named Hepatic Aloes. The Cabbaline is more impure, more fœtid, and is weaker in its power. There is still some uncertainty with regard to the species producing these varieties. The Aloe Perfoliata is that referred to by the Edinburgh College, as affording the varieties both of hepatic and Socotorine Aloes. The Dublin College refer to the Aloe Spicata, and it is said to be this species which is a native of the Cape of Good Hope, whence much of the aloes sold under the name of Socotorine Aloes, is now imported. The London College give it as that which affords the Socotorine Aloes; while the Barbadoes Aloes, on the authority of Sibthorp, they consider as the produce of a species named Aloe Vulgaris. The Socotorine Aloes is the expressed juice of the leaves of the plant, inspissated by exposure to the air and sun. The Barbadoes Aloes is prepared by cutting the plant, and boiling it in water. The liquor is evaporated to the consistence of honey, and is run into large gourd shells, in which it becomes concrete.

The taste of all the kinds of aloes is intensely bitter; their odour is disagreeable. They consist of extract and resinous matter; the former being in larger quantity; the latter, obtained by the action of alcohol, has little smell or taste. Alcohol diluted with one, or even with two parts of water, dissolves all the active matter of this concrete juice. Boiling water also dissolves it, but a portion of resin is deposited as the solution cools.

Aloes, as a cathartic, has some peculiarities. It is slower in its operation than other purgatives; it merely evacuates the contents of the intestines; and no greater effect is obtained from a large dose than from one comparatively moderate. These have been regarded as proofs, and perhaps justly, that its operation is principally on the larger intestines. Its medium dose is from 5 to 10 grains, and its usual form of exhibition that of pill. As a purgative, it is employed to obviate habitual costiveness; and from operating simply as an evacuant, and without irritation, it is peculiarly adapted to this. Hence its use in hypochondriasis, in jaundice, and other cases attended with torpor of the intestinal canal. It is also often combined with other cathartics to produce more complete evacuation. From the supposition of its stimulant operation being particularly exerted on the rectum, it has been supposed to have a tendency to occasion hæmorrhoids,—an opinion for which there does not appear much foundation. On the supposition, too, of its stimulating effect being extended to the uterus, it has been regarded as a purgative to be avoided during pregnancy: on the same hypothesis, it has been supposed to act as an emmenagogue, and is not unfrequently used in amenorrhœa.

Offic. Prep.—Pil. Aloet. Pil. Al. et Assafœt. Pil. Aloes cum Colocynth. P. Aloes cum Myrrh. Tinct. Aloes. Socc. T. Aloes. Æth. T. Aloes cum Myrrh. Vin. Aloes Socc. *Ed.*—Pil. Aloes cum Zingib. Pulv. Al. cum Canella. Pulv. Al. cum Guaic. *Dub.*—Pulv. Aloes Comp. T. Aloes C. Decoct. Aloes. Compos. *Lond.*—Extractum Aloes purificat. *Lond. Dub.*

CONVOLVOLUS SCAMMONIA. Scammony. *Pentand. Monogyn. Campanaceæ. Gummi-resina. Syria.*

SCAMMONY is obtained by cutting the root of the plant obliquely, a few inches above the ground. A milky juice exudes, which is collected, and inspissated by exposure to the sun and air. It is in small fragments, of a blackish-grey colour, having little smell, and a bitter sub-acrid taste. It is, however, variable in its qualities, and is often adulterated by the intermixture of earthy matter. It is one of what are named Gum resins, and consists of resin and gum in general nearly in equal proportions. Water dissolves about one-fourth of it; alcohol dissolves about two-thirds, proof-spirit almost entirely, the impurities excepted.

Scammony is one of the drastic purgatives, and is employed chiefly where the less powerful substances of this class would fail. Its dose is from 5 to 10 grains, but it is generally combined in a smaller dose with other cathartics. It is also used as a hydragogue purgative in dropsy, combined usually with super tartrate of potash; and it is employed as an anthelmintic cathartic, combined with jalap and calomel.*

Offic. Prep.—Pulv. Scamm. C. *Ed.*—Pulv. Scamm. C. Confect. Scamm. *Lond. Dub.*

GAMBOGIA. Gamboge. Stalagmitis. Cambogioides. *Polygam. Monoec. Tricoccæ. Gummi-resina. India.*

THIS gum-resin is obtained by exudation, from incisions in the branches and trunk of the tree, and is afterwards inspissated. It is brittle, of a lively yellow colour, and resinous fracture; has a taste bitter and acrid. Water and alcohol partially dissolve it, and its solution in alcohol becomes turbid on the addition of water; the alkalies also dissolve it. It affords one of the best examples of what is named a Gum-resin; the proportion of resin appears to exceed considerably that of gum, alcohol dissolving a much larger quantity of it than water does.

Gamboge is a very powerful cathartic, liable in large doses to excite vomiting, or to act with violence, and occasion profuse evacuation, with griping and tenesmus. Its medium dose is from 2 to 6 grains. It is seldom employed but in combination with some of the other powerful cathartics, in obstinate constipation. It is also used to expel the tape-worm, and as a powerful hydragogue cathartic in dropsy. In the latter application of it, it is usually combined with super-tartrate of potash.

Offic. Prep.—Pil. Gambog. comp. *Ed. Lond.*

SUB-MURIAS HYDRARGYRI. MURIAS HYDRARGYRI MITIS. CALOMELAS. Mild Muriate of Mercury. Sub-muriate of Mercury. Calomel.

NEARLY all the preparations of mercury have a purgative power, and peculiarly promote the action of other cathartics. This effect, as has been already stated, is even obtained when the general mercurial action is established, by the introduction of mercury by friction, and shews therefore a peculiar determination to the intestines. The cathartic power is more considerable, however, in the mild muriate than in the other mercurials, and it is in common use as a cathartic. It operates as such, when given alone in a dose of from 5 to 10 grains, but with more certainty and power when its operation is promoted by the addition of a little jalap or rhubarb. One valuable quality which it has, is that of promoting the operation of other

* *Incompatible Substances.* The fixed alkalies occasion yellow precipitates, and the mineral acids appear to destroy a part of the substance without in the least altering the rest. Paris. *Ed.*

cathartics, without exciting any additional irritation or rendering them liable to act with violence; it is therefore, in obstinate cases of constipation, or where it is an object to procure full evacuation, combined with colocynth, scammony, or gamboge; and such a combination affords the safest of the powerful cathartics. Calomel also appears to be adapted to answer particular indications, from its action on the liver, and its power of promoting the discharge of bile. Hence the advantage derived from it as a purgative in different forms of fever, particularly those of warm climates, and in chronic hepatis.

A DIVISION of Cathartics remains, intermediate in their operation between the Laxatives and Purgatives, more powerful than the one, less acrid and stimulating than the other. These are the compound Salts. They appear to act principally by stimulating the exhalent vessels on the internal surface of the intestines, so as to cause a larger proportion of serous fluid to be poured out, which dilutes the contents of the canal, and by its operation, aided by the stimulus of the saline matter, accelerates the peristaltic motion. By the watery evacuation which they thus occasion from the general system, they are particularly adapted to those cases where inflammatory action or tendency to it exists.

SULPHAS MAGNESIÆ. Sulphate of Magnesia.

THIS salt, formerly known by the names of Bitter Purging Salt, and Epsom Salt, is found in mineral waters, whence it is used to be extracted, but is now principally obtained from the liquor remaining after the crystallization of muriate of soda from sea-water, which holds a quantity of it and of muriate of magnesia dissolved. This is boiled down, and when exposed to sufficient cold, affords acicular crystals of sulphate of magnesia; the quantity of which is sometimes increased by previously adding to the bittern sulphate of iron, by which part of the muriate of magnesia is decomposed. The crystals procured by this process are deliquescent from the presence of a little muriate of magnesia; they are obtained more pure by a slower evaporation, or by a second crystallization, and then form large regular crystals, which are rather efflorescent. They are soluble in nearly an equal weight of water at 60°. Their taste is extremely bitter.

This salt is used as a purgative, in a dose of from one to two ounces, dissolved in water. Though its taste be bitter, it has been remarked that it remains better on the stomach than many other cathartics, especially when given in small repeated doses, and in a solution largely diluted. Exhibited in this manner, it has been particularly recommended in ileus and colica pictonum; and is besides in common use in all cases in which saline cathartics are indicated. It is often an ingredient also in purgative enemas.*

SULPHAS SODÆ, Sulphate of Soda, long known by the name of Glauber's Salt, is prepared by various processes on a large scale. In the pro-

* *Incompatible Substances.* Muriates of ammonia, baryta, and lime, nitrate of silver, subacetate and acetate of lead. The fixed alkalies and their carbonates precipitate from it magnesia and its carbonate. Phosphate of soda occasions no immediate precipitate, unless ammonia be present, in which case the triple ammoniaco-magnesian phosphate will be produced. The addition of ammonia, which in the form of spiritus ammoniæ aromat. is not unfrequently prescribed in conjunction with a solution of this sulphate, forms also a triple salt, and a portion of magnesia is precipitated; whenever therefore this ammoniacal stimulant is ordered with a purgative salt, the scientific physician will prefer a solution of the sulphate of soda. Paris. *Ed.*

cess given in the Pharmacopœias, it is obtained from the residuum of the decomposition of muriate of soda, by sulphuric acid, in the preparation of muriatic acid. The saline mass is dissolved in water; any excess of acid is neutralized by the addition of lime, and the pure sulphate of soda is obtained by evaporation. Its crystals are six-sided prisms; they are efflorescent, soluble in three parts of cold, and in an equal part of boiling water. The taste of this salt is very bitter and nauseous; but operating effectually and mildly, it is one of the saline purgatives in common use. Its medium dose is an ounce and a half, dissolved in six or eight ounces of water.*

Sulphas Potassæ. Sulphate of Potash, formerly named Vitriolated Tartar, is prepared by adding dilute sulphuric acid to a solution of subcarbonate of potash, or by neutralizing the excess of acid in the saline mass, which is the residuum of the distillation of nitric acid from sulphuric acid and nitre. It forms in irregular crystals, which require 17 parts of cold water for their solution. In a dose of 4 or 6 drachms, it acts as a purgative, but its sparing solubility prevents it from being much employed; in one of 2 or 3 drachms, it is given as an aperient, frequently in combination with rhubarb or other vegetable cathartics.†

Super-Tartras Potassæ. Super-Tartrate of Potash, formerly Tartar; Crystals or Cream of Tartar, (Tartarum Crystalli vel Cremor Tartari.)

This salt is deposited from wine, in the progress of the slow fermentation which it suffers when kept. It appears to be derived from the juice of the grape, and is probably separated by the diminution of the solvent power of the juice by the evolution of its spiritous product. The deposite, Tartar as it is named, adheres to the sides of the casks in which wine is preserved; it is of a red colour, from part of the colouring matter adhering to it: from white wines it is deposited of a lighter shade, and hence the distinctions of red and white tartar in commerce. This saline matter consists essentially of tartaric acid and potash, the acid being in excess; it is therefore the Super-tartrate of Potash: it also usually contains a small portion of tartrate of lime. It is purified by boiling it in water with a portion of pure white clay, which appears to attract its colouring matter; from the boiling liquor strained while hot, crystals are deposited on cooling, white and semi-transparent, of no very regular form. These used to be named Crystals of Tartar, while the crust collected from the surface of the boiling liquor was named Cream of Tartar. The crystals are reduced to powder for use, and to this powder the latter name is still frequently given. This salt consists, according to Thenard's analysis, of 57 of acid, 33 of potash, and 7 of water. Its taste is sour from its excess of acid. It is sparingly soluble in water, requiring about 60 parts of cold, or 30 of boiling water, for its solution. It operates as a purgative in a dose of 4 or 6 drachms, and being free from any unpleasant taste, it is not unfrequently used, more especially in inflammatory states of the system. It is, from its insolubility, given generally under the form of electuary; the only inconvenience attending its operation, is its being liable to occasion flatulence: and if habitually used, it is liable from its acidity to injure the tone of the stomach. It appears, at the same time, to increase the action of the absorbent system; hence it acts as a diuretic, and as a hydragogue and diuretic, is one of the remedies most frequently employed in dropsy; it is

* *Incompatible Substances.* The same as those which decompose sulphate of magnesia. Paris. *Ed.*

† *Incompatible Substances.* It is partially decomposed by the nitric and muriatic acids. It is entirely decomposed by lime and its compounds, oxymuriate of mercury, nitrate of silver, acetate and subacetate of lead. Paris. *Ed.*

also the cathartic most effectual in removing obesity. As a diuretic and refrigerant, it is to be afterwards noticed.*

Tartras Potassæ. Tartrate of Potash. Tartarum Solubile. Soluble Tartar.

This salt, the neutral tartrate of potash, formerly named Soluble Tartar, from its great solubility, is prepared by saturating the excess of acid in the super-tartrate by the addition of a solution of carbonate of potash. From its affinity to water, it is not easily crystallized with regularity; when obtained by evaporation in the state of a dry powder, it is even somewhat deliquescent; its taste is bitter. It is a mild purgative, and at the same time operates effectually, given in a dose of six drachms or an ounce.†

Tartras Sodæ et Potassæ. Tartrate of Soda and Potash.

This salt, formerly known by the name of Rochelle Salt, is a triple one, being prepared by saturating the excess of acid in the super-tartrate of potash by adding a solution of carbonate of soda. It crystallizes in large and regular transparent rhomboidal prisms, which are permanent in the air, and soluble in about six parts of cold water. Its taste is less unpleasant than that of the greater number of the saline purgatives, and it is therefore often prescribed. Its medium dose is an ounce, given usually dissolved in tepid water.

Phosphas Sodæ. Phosphate of Soda.

To prepare this salt, bones are calcined to whiteness, so as to consume the animal matter, and obtain the phosphate of lime, which is their base. The calcined bone in powder is submitted to the action of sulphuric acid, which combines with part of the lime, and leaves a super-phosphate of lime, which is dissolved by water. To this solution, a solution of carbonate of soda is added, till there remain a slight excess of alkali; the soda combines with the excess of phosphoric acid of the super-phosphate; the neutral phosphate of lime, which the excess of acid held in solution, is precipitated, and by evaporation the phosphate of soda is obtained crystallized. Its crystals are rhomboidal prisms. Its taste is the least nauseous of all the saline purgatives, and is indeed perfectly mild, and its operation is equally mild and effectual. Hence it has been introduced into practice, and is peculiarly useful as a cathartic where there is any tendency to nausea. One ounce of it is given, dissolved generally in tepid water, or in soup made without salt.

Murias Sodæ. Muriate of Soda.

This salt, formed of soda and muriatic acid, is the most abundant saline natural product. It exists in a fossil state, forming what is named Rock Salt; it is the principal saline ingredient in the water of the ocean; and is a common ingredient in mineral waters. It is usually procured by evaporation from sea-water in small irregular crystals; when more regularly crystallized. the form of its crystals is a cube; its taste is purely saline. Like other salts, it excites thirst, an effect probably arising from its action on the absorbents; it also operates as a grateful stimulant on the stomach, and hence its universal use as a condiment. In large doses it

* *Incompatible Substances.* Alkalies and alkaline earths, mineral acids, &c. Paris. *Ed.*

† *Incompatible Substances.* Magnesia, baryta, lime, acetate and sub-acetate of lead, nitrate of silver. All acids, even the carbonic, and acidulous salts, tamarinds, and other sub-acid vegetables, by neutralizing a proportion of the base, convert it into the state of super-tartrate. Paris. *Ed.*

proves purgative ; but its strongly saline taste prevents it from being employed ; it is sometimes, however, the principal ingredient in purgative mineral waters, in which it operates more powerfully, probably from the state of dilution. It forms the active ingredient of the common domestic enema ; from half an ounce to an ounce of it being dissolved in a pound of tepid water, and a small quantity of expressed oil added.

MURIAS MAGNESIÆ. Muriate of Magnesia.

THIS salt is, next to muriate of soda, the principal saline ingredient in sea-water, and communicates to it its purgative quality. It frequently communicates the same quality to mineral waters, of which it is a common ingredient ; but not being easily obtained crystallized, or even solid, owing to its strong affinity to water, it is not used in its pure form.

BESIDES the preceding Cathartics, there are some which are employed as such only under the form of Enema.

TEREBINTHINA VENETA. Venice Turpentine. *Pinus Larix. Monoec. Monadelph. Coniferæ.*

THE resinous juice of this tree, the Larch, exudes from incisions made in its trunk. It is of the consistence of honey, has the peculiar smell of the turpentines, and a bitter acrid taste. It consists of resin and essential oil ; sometimes it is employed as a cathartic under the form of enema, half an ounce of it being triturated with the yolk of an egg, and suspended in a sufficient quantity of water. As it has a considerable share of acrimony, it is employed only where those of milder operation fail.

NICOTIANA TABACUM. Tobacco. (Page 95.)

THE smoke of tobacco, introduced into the intestines, has succeeded in producing evacuation in colic and ileus, after other purgatives have failed, probably from its narcotic operation inducing relaxation of the muscular fibre. An infusion of one drachm of it in a pint of warm water is more convenient ; but much caution is requisite in the use of either, as tobacco, from its narcotic power, is apt to induce extreme sickness and debility. It is only where other methods have been unsuccessful, that its administration can be proper.

[JUGLANS CINEREA. Butternut. Oilnut. White Walnut. *Monoec. Polyand.* Nat. Ord. *Amentaceæ. Cortex. America.*

THE Butternut is a well known forest tree, abundant in almost every part of the United States. It flowers in April and May. The part used in medicine is the inner bark, an extract of which furnishes us with one of our most valuable indigenous cathartics. Dr. Bigelow informs us that the bark of the branches affords a large quantity of soluble matter, principally of the extractive kind. In a concentrated tincture he could discern no appearance of resin. Gelatin did not detect the presence of tannin. The sulphate of iron caused a brownish-black colour. Water is an adequate solvent for the butternut, and the watery extract one of its best preparations. As a cathartic it has been known and used in this country for many years. During the revolutionary war it was extensively used in our military hospitals, and found to be a valuable substitute for jalap and other cathartics. The character which it then acquired, it has since retained ; and it is at present very generally used in the practice of this country. As a mild laxative, calculated to obviate habitual costiveness, it may be considered as unrivalled, as it is not succeeded by any of those unpleasant consequences which generally attend the frequent use of other

articles. From the mildness of its operation it has been much celebrated in the treatment of dysentery. As an active purge, its powers may be greatly increased by the addition of calomel. As the virtues of this extract depend very much upon the method of preparing it, as well as upon the season when the bark is collected, both these circumstances should be carefully attended to. The proper time for gathering it is in the months of May and June. The bark of the root possesses the property of exciting a blister when applied to the skin.

The dose of the extract is from 10 to 30 grains, according to the effect intended to be produced. B.]

[Podophyllum Peltatum. May apple. Mandrake. Wild Lemon. Ipecacuanha. *Polyand. Monogyn.* Nat. Ord. *Rheades. Radix. United States.*

This plant is common to almost every part of the United States, and is found inhabiting low, moist, and shady situations. It flowers in May and June. The leaves of this plant are poisonous, and the root is the only part used in medicine.

According to analysis it contains a resin, a bitter extractive matter, fœcula, and a slight proportion of a gummy substance. As a medicine this plant holds a high rank in the list of our indigenous cathartics From a series of very ingenious comparative trials instituted by Dr. Schneck, it appears to possess virtues strikingly similar to those of Jalap. He concludes that " the only difference between them is that the May-apple root is more prompt in its effect, causes somewhat more nausea, but not occasioning any griping, which has been a constant attendant in the experiments made with the jalap."* In intermittent and remittent fevers, as well as in dropsies, the podophyllum has been esteemed more especially serviceable. According to Schoepf, it acts as an emetic. This effect, however, only follows its use in very large doses. In moderate doses, it operates simply as a cathartic. The dose is twenty grains to be given in substance or in powder. According to Dr. Barton, it is most advantageously used in combination with calomel or crystals of tartar. By our Indians it is considered as an anthelmintic ; whether it possesses any powers of this sort independently of its operation as a cathartic, is extremely doubtful. The proper period for collecting the root for medicinal use is the autumn, when the leaves of the plant have turned yellow. It should be carefully dried, and then pulverized. B.]

[Croton Tiglium. *Monoec. Monadelph.* Nat. Ord. *Tricoccæ. Ceylon.*

This plant is a native of Ceylon, and is also found in China, Cochinchina, the Molucca Islands, and indeed almost every part of the Indian peninsula. Every portion of it seems to possess medicinal virtues, although the *seeds* are the part more commonly used. As imported in the shops, these were long known under the name of *Molucca grains*, and their medicinal effects were well understood many centuries ago. In India, where they have been much used, they still continue to be esteemed as among their best purgatives. Owing probably to the violence which not unfrequently attends their operation, they had long since been banished from European practice. Very recently the Croton has again become popular, and it is now extensively used both in Europe and in the United States. The Expressed Oil, the form in which it is at present used, is of a pale reddish-brown colour, with a faint odour, and possessing a hot acrid

* New-York Medical and Physical Journal, No. 5.

taste. When applied to the tongue it leaves a pungent and uneasy feeling in the mouth and throat, which continues for several hours. From the analysis of Dr. Nimmo, 100 parts of Croton Oil are found to consist of 45 parts of an acrid principle, and 55 parts of fixed oil, resembling the oil of olives. It is in the acrid principle alone that the purgative property of the article resides, and to this Dr. Paris proposes to give the name of *Tiglin*. The *seeds* were also analyzed by Dr Nimmo ; and from this it appears that the *shells* which constitute 36 parts in 100 of the seeds, possess no acrimony. Of the *kernels* of the seeds, 100 parts consist of 27 parts of acrid principle, 33 parts fixed oil, and 40 parts of farinaceous matter.

Croton Oil is wholly soluble in oil of turpentine and ether. Alcohol dissolves only the Tiglin, with a very small portion of the fixed oil ; hence this is considered as the best form in which it can be administered.

Croton Oil is a hydragogue cathartic, acting very powerfully and promptly after it is taken ; and it may be used with advantage in every case in which it is desirable to make a strong impression upon the intestinal canal, and to cause copious evacuations. In using it, however, the greatest caution is to be observed, as the most alarming effects have not unfrequently been produced by it. When given in doses too large, besides causing hypercatharsis, it very powerfully affects the nervous system, occasioning vertigo, and general tremor. In suitable doses, generally speaking, it acts without producing any griping.

The average dose of this oil is from one to two drops, and the form in which it is usually given is that of pill, made with mucilage or crumb of bread. As already stated, the alcoholic solution possesses some advantages over every other form of using it ; and the only objection to it is that it produces a great sensation of heat and uneasiness in the fauces, which is continued down the alimentary canal. To obviate this objection, the following formula is proposed by Dr. Nimmo. ℞. Alcoholic solution, (made in the proportion of ʒj of rectified spirit. to two drops of the oil), ʒss Syrupi simp :—Mucilag Gum Arab. āā ʒij aq. distillat. ℥ss ft. haustus. After swallowing a little milk the draught is to be taken very quickly, and washed down with repeated quantities of the same diluent. In this form this remedy was administered by Dr. Nimmo in more than 100 cases. Slight vomiting was produced in not more than three or four cases, and in not many more was nausea felt ; and in all cases the purging was induced in a space of time between *half an hour and three hours* after taking the medicine. The purgative effects were generally moderate, and rarely accompanied with griping. B.]

[Carbo Ligni. Charcoal.

As an antiseptic, the virtues of common charcoal have long been known. Although not much used for other purposes, its properties are extensive and important. Upon the intestinal canal it acts as a mild but exceedingly efficient cathartic, while upon the stomach it produces in a very remarkable degree the effects of a local tonic. It has accordingly been used with very great success as a remedy in obstinate constipation of the bowels, and irritable states of the stomach. In the dysenteric forms of fever, as occurring in the West Indies, it was successfully administered by that distinguished medical philosopher, the late Dr. Robert Jackson, to whom, I believe, we are indebted for the first introduction of this valuable remedy into general practice. From a tea-spoonful to a table-spoonful of the charcoal is an average dose. It may be mixed in milk or water, and repeated according to circumstances. B.]

CHAP. IX.

OF EMMENAGOGUES.

The medicines distinguished by the appellation of Emmenagogues, are those which are capable of promoting the menstrual discharge

The suppression of this discharge is supposed to arise from debility of the uterine vessels, or deficiency of action in them. Hence it might be inferred, that the medicines capable of exciting it must be such as can stimulate these vessels.

General stimulants, or tonics, may to a certain degree have this effect, since, in consequence of their action, the uterine vessels must be stimulated in common with other parts. There are accordingly several stimulants, both diffusible and permanent, employed as emmenagogues.

It is doubtful whether there is farther any particular determination to these vessels. It is sufficiently certain, that there are many substances, which, when received into the stomach, have their stimulant operation more particularly determined to one organ than to another. It seems possible, *a priori*, that there may be substances disposed to act more peculiarly on the uterine system ; yet experience does not confirm this supposition ; there being perhaps no proof of any of the substances styled emmenagogues, producing their effect from any specific power.

A stimulant effect, however, produced in neighbouring parts, seems to be in some degree propagated to the uterine vessels ; hence several medicines exert an emmenagogue power, greater than can be ascribed to any general action they exert on the system. It is thus that some cathartics, such as aloes and black hellebore, have been supposed to act, ther stimulus being communicated from the larger intestines to the uterus. They are probably of advantage too in amenorrhœa, simply as cathartics, removing the state of torpor in the intestinal canal connected with the disease; and more advantage is derived from the emmenagogues of this class, than from any of the others.

There is also one stimulus, that of electricity, which can be brought to act more directly ; and it has been sometimes found, under the form of weak shocks transmitted through the pelvis, to operate as a powerful emmenagogue.

Suppression of the menstrual discharge seems to be sometimes connected with spasmodic affection, and hence some remedies belonging to the class of antispasmodics are prescribed occasionally as emmenagogues.

The individuals belonging to this class may be arranged in some measure according to these distinctions ; the most active of them being substances belonging to other classes ; and there being a few only supposed to have any specific emmenagogue power. With regard to all of them, it may by added, that there are no medicines so uncertain in their operation, and none in which the conclusions respecting their efficacy are more liable to fallacy. In general, their administration requires to be continued for some time to obtain their beneficial effects.

EMMENAGOGUES.

FROM THE CLASS OF ANTISPASMODICS.

Castoreum.	Ferula Assafœtida.	Bubon Galbanum.

FROM THE CLASS OF TONICS.

Ferrum. Hydrargyrum.

FROM THE CLASS OF CATHARTICS.

Aloe. Rheum Palmatum. Helleborus Niger.

Sinapis Alba. Ruta Graveolens.
Rubia Tinctorum. Juniperus Sabina.

CASTOREUM. Castor. (Page 102.)

UNDER the history of Castor as an antispasmodic, it was remarked, that it appears to be a substance wholly inert. As an emmenagogue, it has been given in the dose of 10 grains in substance, or more frequently under the form of tincture in the dose of one drachm. No reliance is now placed on its powers.

ASSAFŒTIDA. Assafœtida. (Page 104.)

ALL the fœtid gums have been supposed to possess, along with their antispasmodic property, the power of acting more peculiarly on the uterine system, and have been therefore employed as emmenagogues. Assafœtida, the strongest of them, has been given in amenorrhœa in a dose of 10 to 15 grains, or in the form of tincture in the dose of one drachm. GALBANUM, another of these fœtid gums already noticed, next in strength to assafœtida, has been given in a similar dose. Both of them are usually employed in that form of amenorrhœa which is connected with hysteria; they are also occasionally combined with aloes.

FERRUM. Iron. (Page 117.)

THE powers of iron as a tonic may be supposed capable of being exerted on the uterine system, and of removing suppression of the discharge arising from deficient action of the uterine vessels, more especially when this is connected with a state of general languor and debility. In such cases, accordingly, it is frequently employed as an emmenagogue. The carbonate of iron combined with an aromatic, is given in a dose of 5 or 10 grains daily, continued for some time; the more active preparations of the sulphate and muriate are likewise prescribed, but in general there is some difficulty in continuing their administration, unless in very small doses, from the irritation they are liable to occasion. The chalybeate mineral waters afford perhaps the best form of administering iron in amenorrhœa, an advantage derived from the state of dilution in which it is taken.

HYDRARGYRUM. Quicksilver. (Page 205.)

THE general stimulant operation of this metal may, like that of iron, be supposed to be so far exerted on the uterine system. as to obviate any state of diminished action: some of its preparations are accordingly occasionally employed in amenorrhœa, and with very evident advantage. The mild muriate or calomel is the preparation generally used. It is given in the dose of a grain; and more frequently in combination with other emmenagogues, to promote their action, than alone.

ALOE. Aloes. (Page 196.)

THIS cathartic, it has already been remarked, is supposed to operate

more peculiarly on the larger intestines; and its stimulant operation, it has been imagined, is thence propagated to the uterus. Hence its celebrity as an emmenagogue, though what efficacy it has, probably depends principally, if not entirely, on its cathartic power, and its effect, in consequence of this, of removing the torpor of the intestinal canal The peculiarity of its operation as a cathartic already pointed out, renders it however extremely proper for continued administration. It is given under the form of pill or tincture; and frequently in combination with other remedies, particularly with myrrh, rhubarb, and the preparations of iron. The aloetic wine, and the etherial eloetic tincture, are common forms of preparation under which it is prescribed in amenorrhœa.

Rheum Palmatum. Rhubarb. (Page 192.)

Rhubarb has some analogy to aloes in its cathartic operation, and, like it, has been supposed to produce, probably in consequence of this operation, an emmenagogue effect It is usually given combined with aloes, either under the form of the Compound Pills of Aloes and Rhubarb, or the Tincture of Aloes and Rhubarb. The latter forms a popular remedy usually employed in occasional suppression of the menses, being taken in the dose of two drachms at bed-time.

Helleborus Niger. Black Hellebore. (Page 194.)

Black Hellebore is a powerful cathartic; it was recommended by Mead as an emmenagogue under the form of tincture, one drachm of this being given as a dose at bed-time, and continued for some time. Its emmenagogue power might be supposed to depend on its cathartic operation; in this dose, however, and under this form, it has little sensible effect; and any advantage derived from it is extremely doubtful. The extract has been employed as a more active preparation in combination with aloes, or with carbonate of iron.

Sinapis Alba. Mustard. (Page 182.) *Semen.*

The seeds of this plant have a considerable degree of pungency and when taken unbruised to the extent of half an ounce or an ounce, have a purgative effect. This is a popular remedy, not unfrequently used in amenorrhœa and chlorosis, and may have some effect by its stimulant action on the intestinal canal.

Rubia Tinctorum. Madder. *Tetrand. Monogyn. Stellatæ. Radix. South of Europe.*

The root of this plant, freed from its bark, is dried and prepared for its use in dyeing; it is in slender twigs, of a red colour; has a bitter taste, with little smell. Its colouring matter is extracted by water and alcohol. From the fact that the bones of animals are tinged of a red colour when it is taken mixed with their food, it was once supposed to be a medicine of great subtilty; but this appears to be an effect purely chemical, depending on the affinity exerted by the colouring matter to phosphate of lime. It has been celebrated as an emmenagogue, in a dose of half a drachm thrice a-day. It appears to be nearly inert, and its inefficacy is generally acknowledged.

Ruta Graveolens. Ruta. Rue. *Decand. Monogyn. Mustisiliquæ. Herba. South of Europe.*

This herb, when recent, has a strong unpleasant smell, and a bitter

taste. By distillation it affords a pungent essential oil. It has been prescribed as an emmenagogue under the form of the watery infusion of the dried leaves; and the oil is sometimes combined with aloes, and other medicines of the same class, probably with little advantage.

Offic. Prep.—Extr. Rutæ. Gr. *Ed. Dub.*—Ol. Rutæ. *Dub.*—Confect. Rutæ. *Lond*

JUNIPERUS SABINA. Savin. *Dioecia. Monadelph. Coniferæ. Folia. South of Europe.*

THE leaves of this shrub have a bitter penetrating taste, a strong unpleasant odour, and a considerable degree of acrimony. They afford a very large quantity of essential oil, possessing the general virtues of the plant.

Savin is a stimulant, the operation of which has been supposed to be powerfully directed to the uterine system; so much so, that, according to the common opinion, it is capable of procuring absortion. It has in conformity to this been considered as an emmenagogue, but it is scarcely ever administered internally, nor are its effects known with any precision Externally, the powder of the dried leaves is used as an escharotic, and mixed with lard, is applied as a stimulant to excite suppuration from inflamed surfaces.

Offic. Prep.—Cerat. Sabin. *Ed. Lond Dub.*—Extr. Sabinæ. *Dub.*—Ol. Sabinæ. *Ed Dub.*

[POLYGALA SENEGA. Seneka, or Rattlesnake Root.

THE general properties of the seneka being noticed under the class of expectorants, I shall in this place only allude to the virtues which it is alledged to possess as an emmenagogue. It is to Dr. Hartshorne of Philadelphia that we are originally indebted for this discovery. Dr. Chapman however first announced it to the public in an essay which appeared in the Eclectic Repertory for the year 1812. Both of these gentlemen appear to have had very extensive experience on this subject, and they concur in considering it as entitled to the highest rank in the class of emmenagogue medicines. Dr. Chapman more especially speaks of it in terms of the most unqualified commendation. He says "of the emmagogues which I have tried, this is among the most efficacious, and will be found so in all the forms of amenorrhœa, if administered with a due regard to the state of the system, and in other respects with correct discrimination."* He adds that he thinks it more particularly useful in those cases where the decidua exist. Notwithstanding this decided and highly respectable testimony in favour of this article, it should not be concealed that by other physicians very different opinions are entertained with regard to it. Dr. Eberle affirms that he has tried it repeatedly, but uniformly without success. And he adds, that he is "entirely convinced that Dr. Chapman has expressed an opinion much too favourable of its efficacy as an emmenagogue."† The best mode of administaring the seneka is in the form of decoction, made by simmering in a close vessel ℥j of the bruised root in a pint of boiling water, until the quantity is reduced about one third. About ℥iv of this decoction to be taken during the day, to be increased as far as the stomach will bear at the period when the menses are expected to appear. B.]

* Elements of Materia Medica and Therapeutics, vol. II. p. 8. second edition.
† A Treatise of the Materia Medica, &c. vol. I. p. 423.

[SECALE CORNUTUM. Spurred Rye. Horned Rye. Ergot of Rye.

THE precise nature and origin of the ergot is not yet understood. By some it is believed to be a morbid modification of the seed of the rye. Others suppose it to be the production of an insect, while by a third party it is viewed as a parasitic fungus, resembling the different sorts of smut, &c. The latter of these opinions seems to be in every respect the most probable. Besides rye, the ergot is found attached to several other species of the gramina. Low and moist situations, wet seasons, and newly cleared grounds are said more particularly to favour its production. When taken into the mouth, the taste of the ergot is imperceptible. After a short time it becomes disagreeable, nauseous, and sub-acrid. According to the analysis of Vauquelin, it contains, 1. A fawn yellow colouring matter, soluble in alcohol, and having a taste resembling that of fish oil. 2. A white oily matter, of a sweetish taste, which appears to be very abundant. 3. A violet colouring principle, of the same shade as that of orchil, but differing from it by its solubility in alcohol, and which can be readily fixed on aluminated wool and silk. 4. A free acid, supposed to be partly phosphoric. 5. A very abundant vegeto-animal substance, much disposed to putrefaction, and which furnishes a considerable quantity of thick oil and of ammonia by distillation. 6. A small quantity of free ammonia, which can be obtained at the temperature of boiling water.

As an article of the Materia Medica, the ergot was first introduced to the notice of the medical public in 1807, by Dr Stearns of New-York, as a substance capable of acting specifically upon the uterus, and of accelerating in a very extraordinary manner the process of parturition. As might naturally be expected from the announcement of a remedy so novel and unique, it excited much interest, and as soon as subsequent experience had confirmed its virtues, rose at once into the most unlimited popularity. At present we believe it is universally used throughout this country, and has in a very great degree superseded the use of instruments in difficult and protracted labours. Notwithstanding this very general use of the ergot, there are not a few of our most respectable medical men who look upon it with suspicion, considering it in almost every case in which it is administered as jeopardizing the life of the child. The editors of the New-England Journal of Medicine and Surgery first suggested this opinion in 1812, and they stated that they had been led to it, from "observing that in a large proportion of cases where the ergot was employed, the children did not respire for an unusual length of time after the birth; and in several cases the children were irrecoverably dead." It will not be denied by any one acquainted with the operation of the ergot, that if given in very large doses or at improper periods, it may produce effects exceedingly injurious, if not fatal, to the child. Yet that these are to be considered as the common and necessary consequences attending its use, is contradicted by evidence the most clear and satisfactory.

In a very instructive paper on the subject of the secale cornutum, Dr. Stearns has laid down a set of comprehensive rules regulating its administration. They are in all respects entitled to the serious consideration of every practitioner of the obstetric art. The cases in which he states that it ought never to be administered are the following:

1. It should never be administered where nature is competent to a safe delivery.

2. It should never be administered until the regular pains have ceased, or are ineffectual, and there is danger to be apprehended from delay.

3. It should never be administered until the rigidity of the os tincæ has subsided, and a perfect relaxation been induced.

4. It should never be administered in the incipient stages of labour, nor until the os tincæ is dilated to the size of a dollar.

5. It should never be administered in any case of preternatural presentation that will require the fœtus to be turned.

6. It should never be administered during the continuance of one labour, in larger quantities than thirty grains by decoction in half a pint of water. A table-spoonful of this given every ten minutes generally succeeds better than a larger dose. While this quantity produces its most favourable effects upon the uterus, it does not affect the stomach with nausea or vomiting, which sometimes interrupts its successful operation.

The ergot is indicated, and may be administered,

I. When, in lingering labours, the child has descended into the pelvis, the parts dilated and relaxed, the pains having ceased, or being too ineffectual to advance the labour, there is danger to be apprehended from delay, by exhaustion of strength and vital energy from hemorrhage, or other alarming symptoms.

II. When the pains are transferred from the uterus to other parts of the body, or to the whole muscular system, producing general puerperal convulsions. After premising copious bleeding the ergot concentrates all these misplaced labour-pains upon the uterus, which it soon restores to its appropriate action, and the convulsions immediately cease.

III. When in the early stages of pregnancy, abortion becomes inevitable, accompanied with profuse hemorrhage and feeble uterine contractions.

IV. When the placenta is retained from a deficiency of contractions.

V. In patients liable to hemorrhage immediately after delivery. In such cases the ergot may be given as a preventive, a few minutes before the termination of the labour.

VI. When hemorrhage or the lochial discharges are too profuse immediately after delivery, and the uterus continues dilated and relaxed without any ability to contract.*

From what has already been advanced concerning the operation of the ergot, it is evident that it can have no claims to be considered as an emmenagogue. It seems in all cases rather to check than to promote uterine discharges. B.]

CHAP. X.

OF DIURETICS.

Diuretics are those medicines which increase the urinary discharge; an effect which is probably produced by different modes of operation.

It is obvious, that any substance capable of stimulating the secreting vessels of the kidneys, by direct application to them, may increase their action, and thus produce a more copious discharge of urine. It is probably in this

* New-York Medical and Physical Journal, No 3.

way that many of the saline diuretics act; the principal purpose of the urinary secretion seems to be, to separate from the blood the saline matter it contains, and which would otherwise accumulate in the system; when substances of this kind, therefore, do not operate as cathartics, but are received into the circulating mass, they are brought to the kidneys in the course of the circulation, are secreted by their vessels, and exciting in them increased action, a larger portion of watery fluid is at the same time secreted. Several of these substances, as nitre, or the fixed alkalies, can be detected in the urine by chemical tests after they have been administered, and therefore there can be little doubt of this being the mode in which they operate. There is evidence even of some vegetable diuretics passing off by the same emunctory. The flavour of asparagus, or of garlic, or turpentine, for example, may be observed in the urine discharged an hour or two after they have been received into the stomach.

It is also probable, however, that a diuretic effect is in other cases produced by substances acting only on the stomach, the action they excite being communicated by sympathy to the kidneys. Squill and tobacco appear to act in this manner; there is no proof that they are received into the circulating mass; they act very peculiarly on the stomach, and when they occasion vomiting or purging, they generally fail in their diuretic effect. It may be concluded, therefore, that they exert a peculiar action on the stomach, which, propagated to the kidneys, by means of the general connection subsisting between all the parts of the system, causes an increase in the urinary discharge. The different kinds of ardent spirits, diluted with water, seem to act in a similar manner, as their diuretic effect usually takes place very speedily.

There is still a third mode, in which it is probable that some substances produce a diuretic effect, especially in a state of disease. It is known that persons who drink sparingly discharge less urine than others; and also that where the watery part of the blood is carried off by perspiration, the urinary discharge is diminished. It is farther known, that large draughts of water, or of any mild diluent, if not determined to the skin by external warmth, occasion an increased discharge of urine. It seems probable, therefore, that a similar effect may be produced by the action of substances which powerfully stimulate the absorbent system, and thus bring an increased quantity of serous fluid into the circulating mass. Digitalis is probably a remedy of this kind. Its effect as a diuretic is more certain and powerful, when given to a person labouring under dropsy, than to one in health; in the latter state, indeed, any such effect is scarcely apparent. It appears too to be one of those medicines which stimulate most powerfully the absorbent system; its diuretic power in dropsy, therefore, is probably principally owing to its enabling the absorbents to take up the serous fluid effused: this is of course brought into the circulation, and, like any other watery fluid, is discharged by the kidneys. In cases where a large quantity of fluid has been accumulated, it often produces a discharge so sudden and profuse, as could not be produced unless the action of the absorbents were greatly excited.

On the same principle may be explained the utility of a practice, which is often employed to promote the action of diuretics, that of conjoining mercury with them. Thus, the action of squill as a diuretic is rendered more certain and powerful by combination with calomel; each of them being given in separate doses, or both being united in one formula. The efficacy of this is probably derived from the mercury stimulating the absor-

bents, and, by introducing the effused fluid into the system, promoting the direct diuretic action of the squill.

The effect of these remedies is promoted by drinking moderately of watery liquors; hence the practice that was formerly adopted in dropsy, of diminishing the allowance of drink, is exploded; it was of little benefit in preventing the accumulation of diffused fluid, and the abstinence from liquids that was enjoined, rather prevented the action of the diuretic remedies that were employed for the cure of the disease. Many cases even have occurred, in which pure water, mineral waters, or mild diluents, have acted as diuretics, and effected a cure in dropsy.

The action of diuretics is also considerably dependent on the state of the vessels of the skin. If, when a medicine of this class has been given, these vessels are stimulated by external warmth, its action is rather determined to the surface, and sweat or diaphoresis takes place. But if the surface is kept cool, the diuretic effect is more certain; so much indeed does this state of the surface determine to the kidneys, that the usual diaphoretics may be brought to act as diuretics.

The general effects of diuretics are sufficiently evident. They discharge the watery part of the blood, and by that discharge they indirectly promote absorption. Dropsy is the disease in which they are principally employed, and they are adapted to every form of it. When the urinary discharge can be excited by their administration, the disease is removed with less debilitating effect, and with less injury to the patient, than by any other method. The only other, indeed, than can be employed, is evacuation by purging, which the exhausted state of the system is often unable to sustain. The success of diuretics in dropsy is, however, very precarious; sometimes none of them succeed; sometimes one acts more powerfully than another, though in this there is no uniformity; nor are the causes of this variety of operation well understood. In general it is obvious, that where a strong predisposition to the disease exists, or where it originates from organic affections of the liver, or other chylopoetic viscera, no great advantage can be expected from the mere evacuation of the water by the action of diuretics: it is only in those cases where an accumulation of fluid has taken place from diminished absorption, or some similar cause, that they can be expected to effect a cure. It accordingly often happens in practice, that an increased discharge of urine is effected by the exhibition of diuretics, and still the dropsical swellings are not removed, or if they are, they speedily return. The combination of tonics with diuretics, or the administration of a tonic after the diuretic has operated, is useful in preventing a relapse.

Diuretics have been used in calculous affections, with the view of preventing the increase of the calculus, by rendering the urine more watery; and they have occasionally, though rarely, been employed to lessen plethora, or check profuse perspiration. The use of diluents, so as to increase the quantity of urine, is of advantage in gonorrhœa, and other affections of the urinary passages, by lessening the acrimony of the urine, which excites pain from its action on these parts when they are in an inflamed state.

The cautions with regard to the administration of diuretics are obvious from what has been said of their operation. The surface of the body must be kept cool, and therefore the doses of the medicine ought to be given in the course of the day, and the patient should, if possible, be kept out of bed; their operation is thus more effectually determined to the

kidneys. The use of diluents ought to be permitted, at least this is more necessary with respect to those diuretics belonging to the class of salts, and which operate directly on the secreting vessels of the kidneys, and indeed is probably useful with regard to them all.

The individual diuretics may be considered under the subdivisions of Salts, Vegetable Diuretics, and one or two derived from the animal kingdom.

DIURETICS.

SALINE DIURETICS.

Potassa.
Acetas Potassæ.
Super-Tartras Potassæ.
Nitras Potassæ.
Spiritus Etheris Nitrosi.

FROM THE VEGETABLE KINGDOM.

Scilla Maritima.
Digitalis Purpurea.
Nicotiana Tabacum.
Solanum Dulcamara.
Lactuca Virosa.
Colchicum Autumnale.
Gratiola Officinalis.
Spartium Scoparium.
Ulmus Campestris.
Juniperus Communis.
Copaifera Officinalis.
Pinus Balsamea.
Pinus Larix.

FROM THE ANIMAL KINGDOM.

Meloe Vesicatorius.

SALINE DIURETICS.

Potassa. Potash.

This alkali, the chemical history of which has been already given, (p. 10.), either pure, or in the state of sub-carbonate. operates as a diuretic; and, as has been already remarked, it is secreted by the kidneys, so that, when continued for a sufficient time, it renders the urine alkaline. In its pure state it is scarcely ever employed with a view to this operation; but the saline matter from the ashes of broom, wormwood, and other plants, which consist chiefly of sub-carbonate of potash, used formerly to be frequently prescribed in dropsy. It is difficult to continue the administration of the alkali, however, even in this mild form, to the requisite extent, without occasioning irritation; and being much inferior in diuretic power to the super-tartrate of potash, it has fallen into disuse. When employed, it is given in a dose of 20 or 30 grains dissolved in a large quantity of water, and repeated three or four times in the course of the day. Those mineral waters which contain carbonate of soda, have sometimes proved successful in slighter cases of dropsical affection.

Acetas Potassæ. Acetate of Potash. Sal Diureticus.

This salt prepared according to the process of the Pharmacopœias, by saturating the potash of the sub-carbonate of potash with distilled vinegar, and evaporating the solution to dryness, is obtained in the state of a white foliated mass, deliquescent, and very soluble in water. It has been considered as a powerful diuretic, and has been used in dropsy, half a drachm of it dissolved in water being given every hour or two until it operate.

It is uncertain in its operation, however, and has therefore fallen into disuse.*

Super-tartras Potassæ. Crystalli vel Cremor Tartari. Super-tartrate of Potash. Cream of Tartar. (Page 199.)

This salt, of which the chemical history has been already given, and its application as a cathartic noticed, is extensively employed as a remedy in dropsy, and is inferior in efficacy to few of the substances belonging to this class. There are two modes under which it is exhibited, one so as to excite principally its diuretic effect, the other so as to obtain, along with this, its action as a hydragogue cathartic. When given with the first intention, the form of exhibition is solution in water, from half an ounce to an ounce of the super-tartrate being dissolved in the due proportion (8 or 10 ounces) of water, and this being taken in the course of the day, its operation on the kidneys being promoted by dilution. The more usual practice, however, is to give it in substance, either diffused in a little water, or made into an electuary with syrup, and in such doses as to occasion purging to a certain extent. The dose is various, its operation being apparently much dependent on the action of the absorbents being excited, and this, in different states of disease, being effected with more or less difficulty. Half an ounce is given at first, and this is increased to an ounce or even two ounces in twenty-four hours, the increase of dose being gradually made until its effect on the kidneys or bowels is obtained, this being continued to keep up the effect to the requisite extent, and care being taken not to push it so far as to produce greater evacuation than the strength of the patient can support. It generally causes a considerable discharge of serous fluid into the intestinal canal, so as to produce watery evacuations, and at the same time augments the quantity of urine; the size of the dropsical swelling soon begins to be reduced; and the effused water, according to those practitioners who have represented its efficacy in the most favourable light, is not only removed, but any renewal of the effusion is prevented with more certainty than by the action of other diuretics: hence it has been regarded as in general superior to the other medicines of this class in the treatment of dropsy.

There can be no doubt that super-tartrate of potash proves often a powerful remedy in all the forms of dropsy, and more especially perhaps in ascites; yet the general remark applies to this as well as to the other diuretics, that it sometimes fails where others succeed. It can scarcely be expected to succeed where the disease is connected with visceral obstructions, and in such cases the combination of squill and calomel is probably more successful. It has also some disadvantages. It is frequently necessary to give it in such large doses to obtain its diuretic or its hydragogue effect, that it excites nausea and flatulence, weakens the appetite, and injures the tone of the stomach; and as a greater degree of debility is induced by the operation of purging than by merely exciting the urinary discharge, there is some risk of the powers of the system being exhausted under its use, when it is too long continued, or given to a great extent. These effects, therefore, require to be guarded against, and sometimes lead to a preference of other diuretics, or render it necessary to substitute them where the super-tartrate has received a fair trial.

* *Incompatible Substances.* It is decomposed by tamarinds and most sub-acid fruits; by almost every acid as well as every variety of neutral salt, whether alkaline, acid, or metallic. Paris. *Ed.*

Nitras Potassæ. Nitrate of Potash. Nitrum. Nitre.

This salt, consisting of nitric acid and potash, is frequently formed on the surface of the soil in warm and dry climates. In the South of Europe, its production is usually accelerated by artificial arrangements. Animal and vegetable substances, in a state of decomposition, are mixed with a quantity of carbonate of lime; the mass is exposed to the air, but protected from the rain, and is occasionally stirred. After a number of months, the materials are found to contain nitrate of lime and nitrate of potash. These salts are extracted by lixiviation with water: impure subcarbonate of potash is added, by which the nitrate of lime is decomposed, and the quantity of nitrate of potash increased; and this salt is purified by repeated solutions and crystallizations. During the process by which the nitrate of potash is formed, it appears that the oxygen of the atmospheric air, and probably also part of the oxygen of the vegetable matter, combine with the nitrogen of the animal matter, so as to form nitric acid; the affinities whence these combinations arise being favoured by the affinities exerted by the lime. The acid is attracted in part by the lime, and in part by a quantity of potash, either contained in the materials, or, as some have supposed, formed during the process. The nitre used in this country is imported from India, where it occurs as a natural formation.

Nitrate of potash is crystallized in hexaedral prisms. Its crystals are soluble in six parts of cold, and in an equal weight of boiling water. It is decomposed by heat, affording a large quantity of oxygen gas: and from the facility of this decomposition, is an important pharmaceutic agent in oxidating bodies by deflagration.

Nitre has a cool and sharp taste, and occasions a sense of coldness in the stomach when swallowed. When given in moderate doses, continued for some time, its presence can at length be detected in the urine by chemical tests. Its virtues are those of a refrigerant and diuretic, and, as possessing both, it has been used to relieve ardor urinæ in gonorrhœa. The practice, however, is now relinquished, either as inefficacious, or as hurtful, if the nitre is secreted with the urine, as it must render it more stimulating. From its refrigerant power, it has been used in hæmoptysis and in acute rheumatism. Its dose is from 5 to 20 grains repeated twice or thrice a-day, with the free use of diluents or demulcents. Its diuretic power is too inconsiderable to admit of its being employed as a remedy in dropsy.*

Offic. Prep.—Troch. Nitrat. Pot. *Ed.*

Spiritus Etheris Nitrosi. Spirit of Nitrous Ether.

Nitric acid, added in due proportion to alcohol, converts it into a species of ether; but as the process is difficult from the violent chemical action that takes place, it has long been the practice to use less acid than is required to change the whole alcohol into this product; a portion of nitric ether is formed, and this is obtained by distillation, combined with the unchanged alcohol, and generally also from the mutual action not having been complete with a portion of free acid. This process has a place in the Pharmacopœias, and forms what used to be named Spiritus Nitri Dul-

* *Incompatible Substances.* Alum, sulphate of magnesia, sulphuric acid, the sulphates of zinc, copper, and iron; according to the usual laws of affinity it should be also decomposed by sulphate of soda; this however only takes place at the temperature of 32°, and then but partially. Paris. *Ed.*

cis, what is now named Spiritus Etheris Nitrosi. Its odour is fragrant; its taste sharp and acidulous. In medicine it is employed as a refrigerant and diuretic, in a dose of 20 or 30 drops. Being grateful to the stomach, and relieving flatulence, it is often used to correct or promote the action of more powerful diuretics in dropsy.*

DIURETICS FROM THE VEGETABLE KINGDOM.

SCILLA MARITIMA. Squill. (Page 182.)

THE medicinal applications of squill as an emetic, have been already stated. Under this article are to be considered its powers as a diuretic.

Squill, foxglove, and super-tartrate of potash, are the diuretics principally employed in modern practice in the treatment of dropsy; and it is not easy to assign precisely their comparative powers, one frequently proving successful when either of the others has previously failed. Squill operates more directly as a diuretic than the super-tartrate of Potash does, and is not liable, even if its administration has been carried rather far, to produce those injurious effects which arise from the action of foxglove in an overdose. Hence it is frequently preferred. It often deranges, however, the action of the stomach, and occasionally fails in its diuretic effect.

As a diuretic, Squill is always given in substance, under the form of either the recent or the dried root. The dose of the former is from five to fifteen, of the latter from one to three grains: the smaller dose being given at first, morning and evening, in the form of a pill, and this increased slowly until its diuretic effect is obtained. If the dose is too large, it is liable to excite nausea; and the rule has even been delivered, to give it to the extent necessary to induce some degree of nausea. The production of this effect can be regarded, however, only as a test of the squill being in an active state; it is not necessary to its diuretic operation: it proves distressing to the patient; and it has been observed, that when it has once been given to such an extent as to induce this state of the stomach, the same state is more liable to recur even when after an interval it is given in smaller doses. Its nauseating operation, therefore, ought rather to be avoided by the due regulation of the dose.

The diuretic power of squill is promoted by combination with mercury, and it is more frequently employed in this combination than alone. Of the mercurial preparations, either the common mercurial pill, or calomel, may be used; the usual medium dose from which we obtain the general action of either on the system, being added to the dose of the squill, or being given in the evening, while the squill is given in the morning. The superiority of their combined action probably depends on the mercury stimulating the absorbent system, while the squill excites the action of the vessels of the kidneys. This combination is farther adapted to the treatment of dropsy, connected as it frequently is with obstruction or chronic inflammation of the liver or neighbouring organs, and is more successful in this case than any other diuretic. Where the mercurial preparation occasions purging, as this impedes the diuretic action of the squill, mercurial friction may be substituted.

* *Incompatible Substances.* With a solution of green sulphate of iron its strikes a deep olive colour, owing probably to its holding a portion of nitrous gas in solution; with the tincture of guaiacum it produces a green or blue coagulum. Paris. *Ed.*

Digitalis Purpurea. Foxglove. (Page 92.)

Foxglove has been considered as a narcotic ; it is a still more important article of the Materia Medica as a diuretic. It had frequently been used as an empirical remedy in dropsy ; but the violence of its narcotic operation when not administered with due precaution, prevented it from being employed in practice, until Dr. Withering pointed out, with more precision, the rules to be attended to in its exhibition.

It is difficult to compare the powers of the principal diuretics ; yet, on the whole, perhaps foxglove is more powerful than any of them in evacuating the water in dropsy : and the conclusions of Withering are still nearly just, that " so far as the removal of water will contribute to cure the patient, so far may be expected from this medicine ;" and that " although digitalis does not act universally as a diuretic, it does so more generally than any other."—In hydrothorax, its superiority to other diuretics is more clearly established than in ascites or anasarca ; and in the first of these states of dropsy, it is unquestionably superior to any other remedy. Withering affirmed, that it was most successful in those cases of dropsy in which debility is completely marked, where the countenance is pale, the pulse weak, and the muscular energy reduced ; while, in an opposite state of the system it was more liable to fail. In the latter case, therefore, he recommended a previous exhibition of squill, or of super-tartrate of potash, by which some reduction of strength might be induced. The observation, however, has not been confirmed by experience.

There is a peculiarity in the operation of this remedy, that it may be continued for some time without sensibly increasing the flow of urine ; the increase then suddenly commences, and often continues of itself for several days, and to a very great extent, without requiring the continued administration of the remedy, so that the dropsical effusion is more speedily reduced by the action of it than by any other diuretic. Its diuretic power, too, appears only when it is administered in dropsy, and hence there can be little doubt that it operates principally, if not entirely, by exciting the action of the absorbents, the absorbed fluid being discharged by the kidneys. The diuretic effect is not connected with its nauseating operation, or with the reduction in the force of the circulation ; it can, on the contrary, be obtained without either of these accompanying it ; and Withering remarked even, that he had found the increased discharge of urine to be checked, when the doses had been imprudently urged so as to occasion sickness. He observed also, that if it purges, it almost certainly fails, probably owing to its action being determined from the absorbents to the intestines.

Foxglove is given under the form of the dried leaves in substance, or in infusion or tincture. The tincture has been supposed to be better adapted to its exhibition as a narcotic. The infusion is a preparation sufficiently uniform and active, and its dose is rather more easily regulated with precision, so as to admit of a gradual increase, than that of the powder. Its action, too, is at once exerted on the stomach, and there is therefore less risk of its effect being delayed until it is accumulated. The medium dose of the powder is at first from half a grain to a grain twice a-day: from half an ounce to an ounce of the infusion, prepared according to the formula of Withering, now received into the Pharmacopœias, is a similar medium dose.

The great desideratum with regard to this remedy, is to conduct its administration so as to obtain its diuretic effect, without those consequences

which arise from its action accumulated in the system. The rules given by Withering for its administration, are to give it in a dose from 1 to 3 grains of the powder, or one ounce of the infusion, which, if the symptoms be urgent, or the patient stronger than usual, may be given once in eight hours: and the dose is to be continued until the medicine acts on the kidneys, the stomach, the pulse, or the bowels; and is to be stopped on the first appearance of any one of these effects.

Though Withering enjoined strictly the caution necessary in the use of Foxglove, the doses prescribed in his directions are perhaps rather large; and the propriety of the method which has sometimes been recommended, of progressively increasing the dose until the effects are obtained, is doubtful. If the dose be at first small, or at least if, having been raised to one grain of the powder, or one ounce of the infusion, twice in twenty-four hours, it be continued at this quantity, the diuretic operation will be obtained in no long time without any unpleasant symptoms, and when it commences, will continue of itself, even though the dose be suspended. Or if, from peculiarity of habit, or the state of disease, the dose requires to be increased, it ought to be done slowly, and without that regularly progressive augmentation which has been recommended. And if the effect begin to cease before the reduction of the dropsical swelling be completed, it may be easily renewed by a repetition of this moderate dose. This mode of administering foxglove is that suggested by the nature of its action. The peculiarity which is characteristic of it, is its tendency to accumulate in the system, its effects not appearing for a time, but at length being suddenly induced. There is no necessity, therefore, to increase its dose, or to give one that is large, with the view of speedily inducing its action, since, from its continued administration, this will in no long time be established, and without that hazard which is otherwise incurred from this peculiarity in its operation. The administration of it, however, ought not to be long continued, if it fail in producing its diuretic effect. It always injures the tone of the stomach, even where it has not been pushed to that extent to occasion nausea; and there is reason to believe, that from its general debilitating operation, the powers of the system have sometimes sunk under its protracted use. The alarming symptoms which an over-dose of foxglove is liable to produce, it has already been remarked, are best obviated by small doses of spiritous cordials warm; sulphuric ether, aromatic spirit of ammonia, bitter infusions, and aromatics. Vinegar, which is an antidote to other narcotics, might be tried.

There are other diseases in which foxglove has been supposed to prove useful by its diuretic power; as in insania, and in epilepsy connected with serous effusion in the brain; and in dyspnœa arising from serous effusion in the bronchiæ,—anasarca pulmonum, as this affection is named.

It may, in the treatment of dropsy, be advantageously combined with other diuretics; and its action, like that of squill, is said to be promoted by mercury. An occasional dose of the spirit of nitrous ether is useful as counteracting nausea and flatulence, and aiding its diuretic effect.

Nicotiana Tabacum. (See page 95.)

Tobacco, in its general action, has some resemblance to foxglove, being narcotic, emetic, and diuretic. As a diuretic, it has been employed in dropsy, under the form of infusion, one ounce of the dried leaves being

infused in a pint of water, and ten drops being given, and gradually increased to 60 or even 100. It possesses, however, no peculiar advantage, and its diuretic effect is generally accompanied with sickness and vertigo. It has been given with more advantage in dysuria, and probably where that disease is connected with spasmodic action, the tobacco may prove useful by its antispasmodic, added to its diuretic power.

Solanum Dulcamara. Woody Nightshade. Bitter-Sweet. *Pentand. Monogyn. Solanaceæ. Stipites. Indigenous.*

The young shoots or branches are the part of this plant used in medicine; when first chewed, they have a bitter taste, which is soon followed by a degree of sweetishness, a peculiarity whence its name is derived; their smell is strong and disagreeable. By drying, their activity is much impaired. This plant has a degree of narcotic and of diuretic power. An infusion or decoction of the dried stalks in water has been recommended in dropsy, but it is a remedy of uncertain operation, and is scarcely ever prescribed.

Offic. Prep.—Decoct. Dulcamar. *Lond.*

Lactuca Virosa. Strong-scented Lettuce. (P. 96.)

This plant, though it possesses a narcotic quality, is also a diuretic, and has been recommended under the form of the inspissated juice as a remedy in dropsy, the dose being gradually increased from 5 or 10 grains to 2 or 3 drachms. Though celebrated by the German practitioners, it is never used in this country.

Colchicum Autumnale. Meadow Saffron. Colchicum. *Hexand. Trigyn. Liliaceæ. Radix. Indigenous.*

The root of this plant is bulbous; when recent, it is extremely acrid, a small quantity occasioning a sense of burning heat in the stomach, strangury, and tenesmus; at other times it is entirely void of acrimony; differences which are owing to climate, age, or season. Vinegar dissolves its active matter. It was recommended by Stork as a remedy in dropsy, under the form of oxymel or syrup. These have been received into the Pharmacopœias, the dose of either being 2 or 3 drachms. From the uncertainty, however, of its operation, colchicum has not been established in practice. Lately, it has been employed in the treatment of inflammatory diseases, both acute and chronic, in some cases with success; but it appears rather to be a doubtful remedy.

The Eau Medicinale de Husson, so highly recommended abroad as a remedy in hydrothorax and humoral asthma, but more particularly as a specific in gout, is now discovered to be a preparation of the colchicum autumnale. It is prepared by boiling two ounces of the root of colchicum in four ounces of white Spanish wine, and then filtering.

Offic. Prep.—Syr. Colch. A. *Ed.*—Oxymel. Colch. *Dub.*—Acet. Colch. *Lond.*

Gratiola Officinalis. Hedge-Hyssop. *Diand. Monogyn. Personatæ. Herba. South of Europe.*

This plant is cultivated in our gardens. Its leaves have a strong bitter taste, with little smell. They prove emetic and cathartic, but in a smaller dose produce a diuretic effect, and have been recommended under the

form of infusion in the treatment of dropsy, two drachms being infused in half a pint of warm water, and a table-spoonful being given twice or thrice a-day. Their operation, however, is always uncertain, and liable to be violent.

Spartium Scoparium. Broom. *Diadelph. Decand. Papilionaceæ, Summitatis. Indigenous.*

The tops of the young branches of the broom have a bitter taste, which is communicated both to water and alcohol. The watery decoction, prepared by boiling an ounce of the tops in a pint of water to half a pint, is used as a popular remedy in dropsy, and sometimes with success. It acts as a cathartic and diuretic; being taken in divided doses through the day until its operation is obtained.

Ulmus Campestris. Common Elm. *Pentandria. Digynia. Scabridæ, Cortex interior. Indigenous.*

The interior bark of the elm has a place in the Pharmacopœias, though little employed. It has a bitterish taste, and when boiled with water, affords a mucilaginous liquor. The decoction, which is an officinal preparation, is the form under which it has been used. It is said to operate as a diuretic, but does not appear to be of sufficient activity to form a remedy of any value in the treatment of dropsy. Advantage has been said to be derived from it in some cutaneous affections, especially some forms of lepra. The dose of the decoction is 4 or 6 ounces twice a-day.

Offic. Prep.—Decoct. Ulmi. *Ed. Lond. Dub.*

Juniperus Communis. Juniper. *Dioecia. Monadelph. Coniferæ. Baccæ. Indigenous.*

The berries of this shrub have an aromatic smell, and a warm sweetish taste, with a degree of bitterness, the former qualities residing in the pulp, the last in the seeds. Distilled with water, they afford a considerable quantity of essential oil. The flavour and warmth are also extracted by water by infusion.

Juniper berries given in infusion prove diuretic. The essential oil retains this property; and the spirit of Juniper, or diluted alcohol impregnated with it, forming the spiritous liquor known by the name of Gin, is prescribed, in a diluted state, as a cordial and diuretic in dropsy.

Offic. Prep.—Ol. Juniper. Com. Spir. Junip. C. Comp. *Ed. Lond. Dub.*

Copaifera Officinalis. Balsamum Copaibæ. Balsam of Copaiba or Copaiva. *Decand. Monogyn. Dumosæ. South America.*

This resinous juice, for it is improperly named a balsam, is the produce by exudation from incisions made in the trunk of the tree. It flows thin, but becomes thick and tenacious, is transparent, with a yellow tinge; has a peculiar smell not disagreeable, and a pungent bitter taste. It is insoluble in water, soluble in alcohol, and in expressed and essential oils, and with alkalies forms a kind of saponaceous compound. Distilled with water, it affords nearly half its weight of an essential oil, an insipid resin being the residuum.

Balsam of Copaiba increases the urinary discharge, and communicates to the urine a violet odour. In too large a dose, it is liable to excite inflammation of the urinary passages. From its power of stimulating these

parts, it frequently proves successful in the cure of gleet, where the inflammation has entirely subsided, and the discharge continues from weakness of the exhalents or absorbents of the urethra. It has also been given in leucorrhœa, and in hæmorrhoidal affections. Its dose is 20 or 30 drops, twice or thrice a-day, given in the form of bolus, or what is preferable, as remaining more easily on the stomach, and less irritating, diffused in water by the medium of mucilage.

PINUS BALSAMEA. Balsamum Canadense. Canadian Balsam. *Monoecia. Monadelph. Coniferæ. Balsamum. North America.*

THIS resinous juice, like the preceding, improperly named a balsam, as it affords no benzoic acid, exudes spontaneously from the trunk of the tree. It is of a light yellow colour, transparent, tenacious, and inflammable. By age it becomes thicker; its smell is agreeable; its taste pungent. It is soluble in alcohol and oils, and affords an essential oil by distillation, similar to the oil from the other turpentines, or resinous juices of the different species of pinus.

The medicinal virtues of this resinous juice seem to be the same as those of copaiba, and it is used for the same purposes. Its dose is from 30 to 50 drops. Of any of the turpentines it is the purest.

PINUS LARIX. Larch. Terebinthina Veneta. Venice Turpentine, Pinus Sylvestris. Scotch Fir. Common Turpentine. *Monoecia. Monadelph. Coniferæ.*

FROM these trees a resinous juice exudes spontaneously, and in greater abundance from incisions in the trunk of the tree. It is thick and tenacious; that from the larch tree is semi-pellucid, of a yellowish colour, has a strong peculiar smell, and a bitter pungent taste; it is named Venice Turpentine; that from the Scotch Fir is thicker, less limpid, and its odour is less grateful; it is named Common Turpentine. Both of them, by distillation, with the addition of a little water to prevent the temperature from rising too high, afford an essential oil, which is volatile and inflammable, but more sparingly soluble in alcohol than any other essential oil. The residuum is a resin nearly insipid. The Venice turpentine affords more oil than the other.

This oil, Oleum Terebinthinæ, Oil of Turpentine, is used in medicine much more frequently than the resinous juice itself. It is light, limpid, and volatile; has a strong penetrating smell, and a very pungent taste. It is a powerful stimulant, directed more particularly in its action to the urinary passages, as is evident from the violet odour it communicates to the urine, and from the inflammation it excites when given in too large a dose. From this specific action it has been employed in gleet in a dose from 5 to 10 drops, but its operation is always liable to be violent. It was highly recommended by Cheyne as a remedy in chronic rheumatism, especially lumbago, given to the extent of 2 or [illegible] drachms mixed with honey, In such a dose, however, it is liable to be rejected from the stomach; and it has generally been supposed hazardous from its tendency to act violently on the urinary organs. This oil has lately been employed with much success as a remedy against the tænia or tape-worm, as is to be noticed under the class of anthelminties. Externally it is applied by friction as a stimulant to parts affected with cramp and rheumatism; it forms one of the best applications to scalds; sometimes too it is used as a styptic to

bleeding wounds. The Venice turpentine diffused in water by the yolk of an egg, forms a powerful cathartic enema.

Resina Alba vel Flava. White or yellow resin is the residuum of the distillation of turpentine; its various shades of colour arise from the purity of the juice, or from the degree of heat applied It is fusible and inflammable; is soluble in oils and in alcohol, but insoluble in water. It has little smell or taste, but appears from the practice of the farriers, who give it to horses, to have some degree of diuretic power. It is only employed in the composition of ointments and plasters, which it renders more adhesive, and perhaps more stimulating Various compositions of this kind have a place in the Pharmacopœias, as the Ceratum Resinæ, or Unguentum Resinosum, long known by the name of Basilicon, the Emplastrum Resinosum, and others.

From the wood of the different species of fir, exposed to a low heat, Tar (Pix Liquida) is obtained. It is the resinous matter melted out, intermixed with empyreumatic acetic acid, empyreumatic oil, and a portion of carbonaceous matter. When water is macerated on it, it receives an impregnation of taste and smell,—and this liquor, Tarwater, prepared from a gallon of water macerated on two pounds of tar, was at one period highly celebrated as a remedy in many diseases. It operates chiefly as a stimulating diuretic and diaphoretic. Tar by boiling loses its volatile principles, and acquires a stiffer consistence. This forms Pitch, (Resina Nigra), which is sometimes employed externally as a stimulating application.

Pistacia Terebinthinus. Chio or Cyprus Turpentine. *Dioec. Pentand.*

The Chio turpentine resembles the other turpentines, but is more limpid, fragrant, and grateful: its powers are the same, but not being easily procured, it is never used.

DIURETICS FROM THE ANIMAL KINGDOM.

Meloe Vesicatorius. Cantharis. Spanish Fly. Lytta Vesicatoria. Blistering Fly. *Coleoptera.*

This insect is found adhering to the leaves of certain plants in Spain and Italy; they are detached by shaking the branches, are killed by being exposed to the vapours of vinegar, and are then dried in the sun. They are of a rich lively green and yellow colour; have a faint unpleasant smell, and a taste slightly acrid. Their acrid matter is extracted both by water and alcohol; and a process has been given by Robiquet, by which, as he affirms, it can be obtained in a pure and concentrated form. It consists in reducing the aqueous decoction of cantharides to an extract by evaporation, digesting this repeatedly in boiling alcohol, evaporating the spiritous solution to a thick consistence, and digesting this in cold sulphuric ether; after a few days it is poured off from the undissolved residue, and by spontaneous evaporation it affords a matter in soft scales, with a little oil. The latter is removed by cold alcohol; the former is the acrid vesicating principle pure; the smallest particle of it dissolved in oil, forms a liquor which, applied to the skin, quickly raises a blister.

Cantharides inflame and excoriate the skin, and are hence used as the basis of the common vesicatories. Their active matter appears to have a

peculiar determination to the urinary organs, as even from external application stranguary is sometimes induced; and a small dose of the cantharides internally administered is liable to act with much violence on the kidneys and bladder, producing inflammation and a discharge of bloody urine. In dropsy, it has been given as a diuretic in a dose of one grain once or twice a-day, continued for some time, but it does not appear to be a safe or manageable diuretic: it has been prescribed in a similar dose in obstinate gleet and leucorrhœa, and in retention of urine arising from debility of the body of the bladder, or in the opposite affection of incontinence of urine. It is principally in the latter of these affections that the internal administration of cantharides is attempted,—where the inability to retain the urine arises from weakness of the sphincter vesicæ, a state which the cantharides by its local stimulant operation is adapted to remove. Its action requires to be moderated by the free use of diluents. It has also been employed as a stimulant in amenorrhœa. It is still more extensively used externally as an epispastic, an application of it to be afterwards noticed. The tincture is a milder form, and has been given in a dose of 15 or 20 drops: but it has failed in cases where the cantharides in substance have succeeded, particularly as a remedy in incontinence of urine.

Offic. Prep.—Emplast. Cantharid. Vesicat. Tinct. Cantharid. Vesicat. Unguent. Infus. Cantharid. Vesicat. Unguent. Pulv. Cantharid. Vesicat. Emplast. Cantharid. Vesicat. Compos. *Ed. Lond. Dub.* Emplast. Calefaciens. *Dub.*

[Aurum. Gold. (Page 131.)

The diuretic properties of this metal have already been noticed when treating of it under the head of tonics. B.]

[Pyrola Umbellata. Pippsissewa. Groundholly. Wintergreen. Rheumatism Weed. *Decand. Monogyn.* Nat. Ord. *Bicornes. Herba. United States.*

This is an evergreen plant found in every part of the United States, and flowers in June and July. Its leaves have a sweetish bitter taste, combined with a degree of aromatic pungency. Its properties are extracted both by alcohol and water. Chemical analysis proves it to contain resin, gum resin, tannin, and bitter extractive. The effects of the pippsissewa upon the system are those of a tonic and diuretic. As a diuretic more especially it sustains a very high character. In dropsy it has been exhibited with decided success both in Europe and in this country. In hematuria, nephritis, and ischuria, it has also been used with much advantage, producing effects very analogous to those of the uva ursi. By the elder Dr. Barton it was highly esteemed as an antilithic. Dr. Chapman considers it useful in scrofula, and states that he has "witnessed some striking effects from its exhibition." As an external application to indolent tumours it has frequently proved highly serviceable. It may be administered in tincture, in doses of from ʒj. to ʒij.; or in infusion, made by pouring one pint of boiling water upon ʒi. of the plant in doses of from ʒij to ʒiv. B.]

CHAP. XI.

OF DIAPHORETICS.

Diaphoretics are those medicines which increase the natural exhalation by the skin. When they excite this so copiously as to produce sweat, they are named Sudorifics. The operation of both is the same, differing only in degree ; diaphoretics in doses sufficiently large acting as sudorifics, and sudorifics in diminished doses, or under peculiar circumstances, occasioning only diaphoresis. The fluid effused too is in both cases alike, being chiefly the watery part of the blood, with a slight impregnation of saline matter. In the one case it is discharged more slowly, and therefore passes off in the state of vapour ; in the other it is discharged copiously from the exhalent vessels in the liquid form.

The operation of these medicines is not obscure ; the natural exhalation is merely increased ; the action of the exhalent vessels on the surface must therefore have been augmented, and the substances belonging to this class must be those which stimulate these vessels.

Of stimuli of this kind, external heat affords an example ; it is directly applied to the vessels, and must occasion in them increased action ; hence it often produces sweat, and always promotes the action of sudorifics.

The same effect may be produced by a different operation,—by increasing the general force of the circulation : this propelling the blood into the minute vessels more forcibly acts as a stimulus on the exhalents, and increases their discharge. Hence violent muscular exercise is attended with copious sweating.

In one or other of these modes, the medicines belonging to this class operate,—either directly stimulating the cutaneous exhalent vessels, or indirectly communicating to them increased action by increasing the force of the circulation.

The saline diaphoretics seem to act in the former manner ; they have little or no action on the vascular system, neither increasing the velocity nor force of the circulation ; their action therefore is exerted on the stomach, and thence communicated to the vessels of the skin. Perhaps they may likewise be absorbed into the mass of blood, as they readily pass with the chyle, or enter the absorbent vessels, and may act more directly on the cutaneous vessels.

Those diaphoretics, on the contrary, which are more stimulating, probably act by increasing the force of the vascular system, as they usually augment the force and frequency of the pulse, previous to occasioning sweat.

Diaphoresis is not, however, the necessary consequence of the circulation being increased in force ; for it often happens that the pulse is frequent and hard, when the skin remains dry. In this case there seems to exist a constriction of the exhalents, sufficient to resist the impetus of the blood, and whatever can remove this will favour sweating. Diaphoresis, therefore, it may in general be said, will follow from increased vascular action, when the exhalents of the skin are not morbidly constricted ; and it will take place still more copiously when the circulation is increased in the larger vessels, while the exhalents are relaxed. On this view is to be ex-

plained the operation of tepid diluents, and of external warmth in promoting sweat, the tendency of both being to increase the force of the circulation, and at the same time occasion relaxation of the cutaneous vessels. From producing the latter effect too, small doses of emetics are favourable to diaphoresis; and, from the same principle, the diaphoretic operation of the combination of opium with ipecacuan, or the preparations of antimony, may be accounted for; the primary effect of the opium being to increase the action of the vascular system; that of the ipecacuan or antimony, by its nauseating operation, to diminish the action at the surface, as is apparent from the paleness of the skin, and the sense of coldness with which nausea is attended. Hence the superiority of this combination in sudorific power.

The primary effects of diaphoretics are to evacuate the watery part of the blood, and thus lessen the quantity of it in the circulating system; to determine the blood to the surface from the internal parts; to increase the action of the absorbents, and to remove spasmodic stricture of the cutaneous vessels, and render the skin moist and relaxed.

It is doubtful whether the first of these effects takes place to any extent; for, during sweating, there is generally considerable thirst: as much fluid may therefore be taken in, as will supply what is thrown out; and besides, the other fluid secretions, particularly that of urine, are diminished during the operation. It is probable, therefore, that little alteration takes place in the quantity of fluid contained in the body from the action of diaphoretics; and we can scarcely, in any case, ascribe any beneficial effects they produce to this cause.

The last effect is perhaps the most important; at least it is on this principle,—the removing spasmodic stricture of the cutaneous vessels,—that the efficacy of diaphoretics in inflammatory diseases has been explained. In such affections the skin is dry, and the external heat augmented; but when diaphoresis has been induced, that state is removed, and the skin remains moist and cool. It is with the view of producing these effects that diaphoretics are used in synocha, acute rheumatism, and in the various phlegmasiæ.

Several circumstances contributed to lead physicians to the free use of diaphoretics in fevers. The skin is generally dry and hot; and it was often observed, that a spontaneous salutary crisis is marked by diaphoresis, or even by a copious sweat. Hence it was concluded, that by following the path nature pointed out, and inducing this relaxed state of the vessels of the skin, the disease might be removed. Theory too had its influence in carrying this practice to an immoderate extent, fever being supposed to arise from the presence of morbific matter in the system, and sweating being an evacuation by which it was supposed to be discharged. The limits to the practice have long been established; little advantage appears to be derived from it in the treatment of fevers of the typhoid type, and it is principally in the phlegmasiæ that it is employed in inflammatory catarrh particularly, and in acute rheumatism.

As evacuating the serous part of the blood, and as promoting absorption, sudorifics have been sometimes employed in the different species of dropsy, especially in anasarca, in which the circulation in the extreme vessels on the surface is more or less languid. Cases occur where it is not easy to increase the discharge by urine, and in these sweating has been had recourse to as less debilitating than purging, the only other evacuation that can be excited with advantage. It has been remarked too, that the opera-

tion of diaphoretics, when it has been excited, has been accompanied by an increase in the quantity of urine, a proof of absorption having been promoted. It is difficult, however, to excite sweating in dropsy, and the practice is rarely attempted.

By determining to the surface, and preserving a gentle diaphoresis, the remedies of this class are found serviceable in asthma, dyspepsia, habitual diarrhœa, chronic dysentery, and chronic rheumatism.

In various obstinate cutaneous affections, as herpes and lepra, advantages have been derived from the use of diaphoretics, probably from altering the morbid state of the extreme vessels on the surface. The use of the warm bath, and the antimonial and mercurial diaphoretics, are found more particularly serviceable in such affections.

Several circumstances require to be attended to in the administration of sudorifics. If the disease is inflammatory, the action of the vascular system strong, and the skin dry, with great heat on the surface, those which are of the stimulating kind are to be avoided, as, if they fail in producing sweat, they may aggravate the symptoms. The free use of warm diluents is proper and even necessary, under the operation of full sweating. The patient should be covered with flannel, not only as preserving the temperature more uniform, but also as it absorbs the moisture, which would otherwise carry off the heat too rapidly, and cool the surface. The covering ought rather to be light, as there is no necessity for much external warmth. Too much heat, especially when unaccompanied by humidity, sometimes prevents sweating, probably by stimulating the exhalent vessels, and increasing their force of resistance. It is promoted by partial fomentation, as the application of flannel dipped in warm water, and pressed out, to the feet. Lastly, care is to be taken to avoid the application of cold, either by the admission of cold air to the surface, or the drinking of cold water while the sweat continues, or for some time after it has ceased. When the sweat is to be checked, it is best done by drying the skin, removing the patient into dry flannel, diminishing the covering, and allowing the hands and arms to be exposed to the air.

The particular diaphoretics may be arranged according to the affinity in their operation, as they operate by increasing the action of the vascular system, or as they act without any sensible stimulant operation, though it is somewhat difficult to trace the distinctions of these, or even with regard to every individual, to assign the kind of action it exerts. The saline diaphoretics act principally in the latter mode; the vegetable diaphoretics in the former.

DIAPHORETICS.

Acetas Ammoniæ.	Opium.
Citras Ammoniæ.	Camphor.
Sub-Carbonas Ammoniæ.	Guaiacum Officinale.
Murias Ammoniæ.	Daphne Mezereum.
Sub-Murias Hydrargyri.	Laurus Sassafras.
Antimonium.	Salvia Officinalis.
Sulphur.	

ACETAS AMMONIÆ. Acetate of Ammonia.

ALL the ammoniacal salts are supposed to have a diaphoretic power. The acetate is the one which has been principally used; its solution (Aqua Acetatis Ammoniæ) having been celebrated under the name of Spirit of Mindererus (Spiritus Mindereri) as a diaphoretic in febrile affections. It is prepared, according to the formula of the Pharmacopœias, by neutralizing distilled vinegar, by adding to it sub-carbonate of ammonia, the carbonic acid being disengaged with effervescence, and the acetate of ammonia remaining in solution. Its strength must be various, according to the degree of concentration of the vinegar; but as it is not an active substance, this is not of much importance, especially as it is usually given in divided doses. An ounce is given every hour or two, and its operation is promoted by tepid diluents and the sweating regimen. As it produces no increase of vascular action, it has been supposed well adapted to exhibition in inflammatory fevers, as synocha and acute rheumatism, and it is in such cases that it is usually employed. Its diaphoretic power, there is reason to suspect, is not very great; but it may be rendered more active by its operation being promoted by the addition of small proportions of opium and antimony Externally it is used as a discutient, and sometimes as an application to inflamed parts.*

CITRAS AMMONIÆ. Citrate of Ammonia.

LEMON juice, neutralized by potash, affords a remedy which has long been employed under the name of Saline Mixture, as a refrigerant in fever. When it is neutralized by ammonia, it is supposed, along with its refrigerant, to have a diaphoretic power. Citric acid being the chief constituent ingredient of the juice of the lemon, this preparation is of course a citrate of ammonia. In the diluted state in which the mixture is prepared, it can have no great power; but its diaphoretic operation is sometimes promoted by the addition of a few drops of tincture of opium and antimonial wine.

SUB-CARBONAS AMMONIÆ. Sub-carbonate of Ammonia.

THE salt which has obtained this name, is employed either under the solid form, or in a state of solution, for the preparation of both of which formulas are given in the Pharmacopœias. It is obtained in the solid state by sublimation from a mixture of muriate of ammonia and carbonate of lime, the heat applied giving rise to a double decomposition, the carbonic acid combining with the ammonia, the muriatic acid with the lime, and the ammoniacal carbonate being sublimed. It forms a solid mass, white and efflorescent, which retains the pungent ammoniacal odour, and which, as it also changes the vegetable colours to a green, is rather to be regarded as a sub-carbonate than a carbonate. Its solution (Solutio Sub-carbonatis Ammoniæ) is prepared, according to the formula in the Dublin Pharmacopœia, by distilling water from a mixture of muriate of ammonia and sub-carbonate of soda, sub-carbonate of ammonia being formed by a double decomposition, sublimed, and dissolved by the water which distils over; according to the formula of the Edinburgh and London Pharmacopœias, by

* *Incompatible Substances.* Acids, the fixed alkalies, alum, lime water, sulphate of magnesia, corrosive sublimate, nitrate of silver, the sulphates of zinc, copper, and iron, acetate of lead and magnesia. Paris. *Ed.*

dissolving the sub-carbonate of ammonia in distilled water, and filtering through paper. Under either form it is used as a stimulant, and sometimes as a sudorific, its dose being 10 or 15 grains of the concrete salt, and from half a drachm to a drachm of the solution. Its operation is promoted by the sweating regimen. As a stimulant, the solution is given in a similar dose in languor or faintness, or with this intention, it is used under the more grateful form of its solution in alcohol, with the addition of some of the more fragrant essential oils, forming the officinal preparation of the aromatic spirit of ammonia. The concrete salt is applied to the nostrils, forming what is named the pungent smelling salt.*

Murias Ammoniæ. Muriate of Ammonia. Sal Ammoniacus. Sal Ammoniac.

This salt is prepared by various processes, on a large scale, for the purposes to which it is applied in the arts. The ammonia, which is its base, is usually procured by distillation from urine or bones, and is combined with sulphuric acid, so as to form sulphate of ammonia : or sometimes this salt is procured by maceration from the soot of coal used as fuel, in which it exists in greater or less quantity. As obtained in either way, it is mixed with muriate of soda ; the two salts are decomposed by double affinity, the sulphuric acid uniting with the soda, the muriatic acid with the ammonia, and the muriate of ammonia is sublimed. It is thus obtained in a solid dense mass, of a striated texture, somewhat ductile and semi-transparent. It is soluble in about three parts of cold water, and may be crystallized from its hot solution. In medical practice it is little employed. It has been supposed, in the dose of one drachm, to act either as a diuretic or diaphoretic, according to the mode in which it is administered ; the first effect being obtained when the surface of the body is kept cool ; the other when external warmth is applied, with the use of tepid diluents. It is also applied externally as a discutient to indolent tumors, dissolved in distilled vinegar, with sometimes the addition of a little alcohol ; and a similar solution is used as an application in some forms of inflammation, to chilblains. and to some cutaneous eruptions. But it has a place in the Pharmacopœias principally as being employed in pharmacy.†

Sub-murias Hydrargyri Mitis. Sub-murias Hydrargyri. Mild Muriate of Mercury. Sub-muriate of Mercury. Calomel. (Page 116.)

This preparation of mercury is sometimes employed to obtain its action on the cutaneous vessels ; and in certain diseases, particularly eruptions on the surface, and chronic rheumatism, has been supposed to prove useful by increasing the insensible perspiration. Combined with opium, or with guaiac, it has been supposed to exert a still greater degree of diaphoretic power.

* *Incompatible Substances.* Acids, fixed alkalies, and their carbonates, lime, magnesia, alum, supertartrate of potash, and all the acidulous salts, sulphate of magnesia, acetate, submuriate and oxymuriate of mercury, superacetate of lead, tartarized iron, and the sulphates of iron and zinc. If it be added to decoctions and infusions, they must be previously cooled. Paris. *Ed.*

† *Incompatible Substances.* Sulphuric and nitric acids, potash and its carbonate, carbonate of soda, lime, magnesia, superacetate of lead, nitrate of silver, and all the metallic salts whose bases form insoluble compounds with muriatic acid. Paris. *Ed.*

Antimonium. Antimony. (Page 174.)

A sympathy appears to exist between the stomach and the surface of the body, in consequence of which, the state of the one is to a certain extent communicated to the other; the nauseating effect, for example, of emetics, being accompanied with diminished action at the surface. This sympathetic affection is apparently produced by the prepartions of antimony; and some of them, particularly the oxide of antimony with phosphate of lime, and the tartrate of antimony and potash, are hence employed as diaphoretics in febrile affections. The former is given in a dose from 3 to 8 grains, repeated every third or fourth hour, until its operation as a sudorific, cathartic, or emetic, is produced; the latter being given in a dose of one-half or one-fourth of a grain in a similar manner. The action of both is aided by warm diluents; the phosphate of antimony and lime, being less liable to excite vomiting, and its action being more general in the system, is to be preferred, wherever the object is to cut short the progress of fever, by obtaining a favourable crisis. Where the intention is merely to determine to the surface so as to produce diaphoresis, the tartrate of antimony and potash, given in divided doses, is rather more manageable, and it is rendered more certain and powerful in its effect by combination with opium. The sulphuret of antimony levigated has been employed as a remedy in some cutaneous diseases, and chronic rheumatism; and has been supposed to operate by increasing the insensible perspiration.

Sulphur. Sulphur. (Page 191.)

Sulphur, it has already been remarked, passes off by cutaneous vessels, and with some increase, it has been supposed, of the insensible perspiration. Hence has been explained the advantage sometimes derived from it in habitual dyspnœa, and in chronic catarrh. The solution of it in oil, Oleum Sulphuratum, has been used in the same cases, but is a preparation both acrid and nauseous.

Opium. Opium. (Page 79.)

Opium produces diaphoresis, particularly when its operation is promoted by diluents and external warmth, and in large doses it excites even profuse sweating. It is difficult, however, to employ it alone as a sudorific, from its narcotic power being necessarily exerted at the same time. But by combination with antimony or ipecacuan, a modification of power is produced, more important perhaps than any other arising from the combination of remedies: the narcotic operation of the opium is counteracted, the nauseating effect of the ipecacuan or antimony is also diminished, and we obtain a sudorific more powerful and certain than any other. In the combination with antimony, thirty-five drops of antimonial wine are added to twenty-five of tincture of opium. The combination with ipecacuan is still more powerful. It is an officinal preparation, (Pulvis Ipecacuanhæ et Opii,) and consists of one part of ipecacuan, one of opium, and eight parts of sulphate of potash: these are rubbed together into a fine powder, the sulphate of potash rendering this more easy by dividing the opium, and lessening its tenacity. This has long been celebrated as a sudorific, under the name of Dover's Powder, and is the medicine which is employed where copious sweating is to be induced, as in acute rheumatism, in anasarca, and in every other disease in which this indication is to be fulfilled. Its medium dose is ten grains, given generally in a bolus; its operation is

promoted by tepid diluents and external warmth, the patient being confined to bed. If it fail in producing sweat, other five grains may be given at the end of an hour, and sometimes even it is necessary to give a larger dose. When it operates, the sweating is generally profuse, and by proper management can be kept up for several hours. The power of the combination probably depends on the joint action of the opium and ipecacuan, the former increasing the force of the circulation, while it also produces relaxation at the surface, and the latter aiding this effect by its action, propagated from the stomach to the surface of the body, diminishing the resistance in the exhalent vessels. Such is the effect of this modification, that the combination can be given with safety in pure inflammatory affections, attended with increased vascular action, where the exhibition of opium alone would be attended with hazard.

CAMPHORA. Camphor. (Page 78.)

CAMPHOR has been employed as a diaphoretic in acute rheumatism, in different forms of fever, and in several of the exanthemata, particularly small-pox, in a dose from 5 to 15 grains: but its operation is not sufficiently certain, when it is given alone. Sometimes it is combined with nitre, with antimonials, mild muriate of mercury, or opium.

GUAIACUM OFFICINALE. Guaiac. *Decand. Monogyn. Gruinales. Lignum et Gummi-resina. South America and West Indies.*

THE wood of this tree, and a concrete resinous substance obtained by exudation from incisions in its trunk, are the parts of it used in medicine.

The wood is hard and heavy, of a yellowish colour, has little smell, and a slightly warm bitter taste. Its virtues depend on the small portion of resinous matter which it contains. It is rasped for medicinal use: by boiling in water, its virtues appear to be extracted, and it is under the form of decoction, a formula for which is inserted in the Pharmacopœias, that it is always employed.

Guaiac wood was introduced into practice as a remedy in the treatment of lues venerea, and was at one time even considered capable of affecting a radical cure. It has, however, no such power; but it is employed as an auxiliary, and sometimes with evident advantage, in promoting the action of mercury in the confirmed state of the disease, and in alleviating the various symptoms which arise from a protracted mercurial course. It is likewise occasionally prescribed in cutaneous diseases, in scrofulous affections, and in chronic rheumatism. The dose in which it is given is a quart of the decoction drunk in the course of the day. If taken warm, it produces diaphoresis.

Offic. Prep.—Dec. Guaiac. Off. Comp. *Ed.*

GUAIACUM. Gummi-Resina.

THIS is obtained by exudation from incisions made in the trunk of the guaiac tree, the juice being inspissated by exposure to the sun. It is also extracted by another process, probably not without some injury, that of placing billets of the wood bored longitudinally, across a fire; the resinous matter is melted, runs into the internal cavity, and is collected at the extremity. It is friable, of a greenish or greyish colour, variegated when it has been obtained by exudation; it has a resinous lustre, an odour somewhat fragrant, and a warm bitterish taste. It was regarded as a gum-resin, but, according to the experiments of Brande, it possesses some peculiar

properties, whence it has been regarded as a distinct principle. It in particular suffers changes of colour, apparently from the action of oxygen. Its powder is at first of a grey colour, but becomes green from exposure to the air; and when its solution in alcohol is decomposed by acids, the precipitate assumes various tints of colour. When acted on by concentrated nitric acid, it affords oxalic acid; by the diluted acid a product is formed more highly resinous. It is almost entirely soluble in alcohol. Water by digestion on it dissolves a little extractive matter. Mr Brande obtained the following products by distilling one hundred parts of it:—Acidulous water, 5.5. thick brown oil, 24.5. thin empyreumatic oil, 30.0. charcoal, 30.5. gases consisting of carbonic acid and carburetted hydrogen, 9.0. loss, 0.5.=100.0.

Guaiac is a stimulating medicine, proving diaphoretic in a dose of about half a drachm, and purgative in a larger dose. It is a remedy employed in chronic rheumatism, being given so as to excite sweat, or more usually in smaller doses to keep up a gentle diaphoresis. Its sudorific power is promoted by opium, or the preparations of antimony. It is given either in substance in the form of bolus, or diffused in water by the medium of mucilage, or in tincture. The tincture of it in spirit of ammonia is more highly stimulating than that in proof-spirit, and is generally preferred.*

Offic. Prep.—T. Guajac. T. Guajac. Amm. *Ed. Lond. Dub.*—Mist. Guaiac. *Lond.*

DAPHNE MEZEREUM. Mezereon. *Octand. Monogyn. Vepreculæ. Cortex radicis. Indigenous.*

THE bark of the root of this plant is the part used in medicine; the entire slender twigs of the root are, however, often found in the shops: its taste, when it is chewed for some time, is acrid: but this acrimony is somewhat impaired in drying it; it is extracted by water and by vinegar.

Mezereon is a stimulating diaphoretic, which has been found of service in chronic rheumatism, and in cutaneous diseases. Its principal medicinal application has been, however, in the treatment of some syphilitic affections; and it has in particular been regarded as efficacious in removing venereal nodes, and thickening of the ligaments and periosteum, and in disposing ulcerations to heal. It is given in the form of decoction; two drachms of the bark, according to the officinal formula, with half an ounce of liquorice root, being boiled in three pounds of water, to two pounds, and 4 or 6 ounces of this being given four times a-day. From its acrimony it is liable to excite nausea, hence it is often given in a weaker decoction, and combined with guaiac and sarsaparilla. Such a combination forms the Decoctum Sarsaparillæ Compositum, an improved formula for the Lisbon diet-drink, a preparation which at one period was celebrated in the treatment of these affections.

Offic. Prep.—Dec. Daphn. Mez. *Ed.*

LAURUS SASSAFRAS. Sassafras. *Enneand. Monogyn. Oleraceæ. Lignum. America.*

THIS wood has a moderately fragrant smell, and a sweetish aromatic taste It affords an essential oil by distillation, and yields to water, by infusion or decoction, its flavour and part of its taste. It is slightly stimulant and diaphoretic. Its infusion has been drunk freely in cutaneous dis-

* *Incompatible Substances.* The mineral acids. Paris. *Ed.*

eases, and in chronic rheumatism; it has even been celebrated for its efficacy in the removal of some of the symptoms of syphilis, and it is frequently added to decoctions of sarsaparilla, guaiac, and mezereon, employed in the treatment of protracted syphilitic affections, probably without communicating any real virtue.

Offic. Prep.—Ol. Laur. Sassaf. *Ed. Lond. Dub.*

Salvia Officinalis. Sage. *Diand. Monogyn. Verticillatæ. Folia. South of Europe.*

The leaves of this shrub have an aromatic smell, and a warm bitterish taste. Its aqueous infusion, drunk warm, has been used to produce sweat, or to promote the action of sudorifics; the aromatic quality of the sage adding something perhaps to the power of the warm diluent.

[Eupatorium Perfoliatum. Boneset. (Page 152.)

The diaphoretic properties of the Boneset will be found noticed in the general account given of this plant under the head of Tonics. B.]

[Asclepias Tuberosa. Decumbent Swallow wort. Pleurisy root. Butterfly weed. *Pentand. Digyn.* Nat. Ord. *Contortæ. Radix. United States.*

This plant grows in every part of the United States, but is most abundant in the Carolinas and Georgia. It flowers in June and July. The root, which is the part used in medicine, has a bitter though not unpleasant taste. According to Bigelow its most abundant soluble portions are a bitter extractive matter and fecula. Boiling water is its best menstruum. As a diaphoretic and expectorant the asclepias deserves a high rank among our native medicinal productions. It has been found highly serviceable in rheumatism, catarrh, bronchitis, and the secondary stages of pneumonic inflammation. It has also been recommended as a palliative in phthisis pulmonalis. It may be given in substance and decoction. Of the former the dose is from ℈j to ʒss. The decoction is made by boiling ℥ss of the root in a pint of water. Of this a tea cup full may be taken several times during the day. B.]

CHAP. XII.

OF EXPECTORANTS.

Expectorants have been defined, those medicines which facilitate or promote the rejection of mucus, or other fluids, from the lungs and trachea. The theory that has been given of their mode of operation is extremely obscure and hypothetical. It has been supposed, that in certain diseases, a greater quantity of serous fluid is thrown out by the exhalent vessels in the lungs than the absorbents can take up, and that expectorants facilitate the rejection of this fluid. But as expectoration of this kind is a complicated, and partly voluntary operation, dependent on the action of a variety of muscles, it is difficult to perceive how these remedies can produce any such effect. There are only two classes of medi-

cines which seem capable of promoting expectoration in this manner; powerful stimulants, which, when extreme debility is present, may promote it by giving vigour to the voluntary muscles exerted in the operation, and emetics, which, by exciting vomiting, compress the thoracic viscera, and by calling all the neighbouring muscles into strong action, and rendering both expiration and inspiration more forcible, may facilitate the expulsion of matter from the cavity of the lungs. But these exert no specific action, and are therefore not entitled to the appellation of expectorants; nor indeed are they usually considered as such.

If, therefore, by expectorants, are understood substances capable of promoting, by some specific action on the parts concerned, the expulsion of fluid from the lungs, there appears no reason to believe in the existence of such remedies.

Dr. Cullen, after admitting the difficulty of giving a theory on this subject, supposes that the promoting of expectoration by these remedies, may be owing to their "increasing the secretion of the liquid, that is, to afford a mucus; this, as it is poured from the arteries into the follicles, being always a thin fluid, it may dilate the mucus in the follicles, and may cause it to be poured out from these in a less viscid state, and thereby render it more easy to be brought up by coughing, that is, to be more freely expectorated."

It is possible that some expectorants may act in this manner; but the action of the different individuals belonging to the class, and especially their action in different diseases, cannot always be explained on this principle. There appear indeed to be several modes of operation, by which certain medicines promote expectoration, and which give them a claim to the title of expectorants.

In the first place, by removing constriction on the exhalent vessels in the lungs, expectoration will appear to be promoted. From this constricted state, the usual quantity of fluid is not thrown out to lubricate these parts; expectoration must of course be more scanty than usual; and if medicines are given capable of removing the constriction, expectoration will become more copious. At the same time, the disease will be at least partially relieved, as that morbid state of the vessels, from which some of its symptoms originate, is removed. It is apparently by such a mode of operation that the promoting of expectoration is of service in pneumonia, inflammatory catarrh, and asthma, the principal diseases in which expectorants are employed.

The remedies by which such an effect is induced, according to this mode of operation, must be principally those belonging to the class of antispasmodics, or those which have the power of inducing nausea, either of these being capable by their action of removing constriction of the exhalent vessels. The antimonial preparations, which are perhaps the most powerful expectorants, appear to operate on this principle. Opium must operate in a similar manner.

It is not possible, however, to explain the effect of all the medicines ranked as expectorants from this mode of operation. On the contrary, some of them seem to act on a very different principle. In certain diseases, as in humoral asthma and catarrhus senilis, there is, from debility of the exhalents, or from deficient action of the absorbents, an increased quantity of fluid in the lungs. Some medicines have been supposed to promote its expectoration: but it is more probable that any relief they afford is by diminishing its quantity. There appear to be certain substances peculiarly

determined to the pulmonary vessels, as their odour is discernible in the air expired. These may stimulate the exhalent vessels through which they pass, and by this stimulus may moderate the effusion of fluid, and thus render the expectoration of the remainder more easy. Any medicine promoting absorption of the effused fluid, will to a certain extent have a similar effect. There is another mode, too, in which the quantity of fluid in the lungs may be diminished, that of determining to the surface of the body, so as to increase the insensible perspiration; and it is probable, that some of the substances which have been used as expectorants, particularly those connected with the class of diaphoretics, owe what virtues they have to this operation.

Expectorants are not, then, to be regarded as medicines which assist the rejection of a fluid already secreted, or which, according to Dr. Cullen's opinion, alter its consistence, and render it thin where it is too viscid, by which its expulsion is rendered more easy. They are rather to be considered either as increasing the natural exhalation where it has been deficient, in which case the expectoration that takes place is the consequence of this, and not the cause of any relief that is afforded; or as diminishing the quantity of fluid where it is too copious, either by stimulating the exhalent vessels, increasing the action of the pulmonary absorbents, or determining to the surface of the body, by which diminution the expulsion of the remaining fluid is facilitated. On one or other of these principles we may, with sufficient probability, explain the effects of this class of remedies, and their application to the treatment of diseases.

From this diversity of operation, it is evident that expectorants will prove useful in opposite diseases, and that in some morbid affections advantage may be derived from those belonging to one division, but not from the other.

In pneumonia, where the expectoration is deficient, as this arises not from any deficiency of power to expectorate, but from a diminution of the fluid usually thrown out into the bronchiæ, owing to a constricted state of the exhalent vessels, it is evident that those expectorants which act by removing such a state, will be most useful, while such expectorants as stimulate these vessels would be rather prejudicial. Hence the utility in this case of nauseating doses of tartrate of antimony, or of ipecacuan; and similar advantage may be derived from the use of these remedies in catarrh and perhaps also in spasmodic asthma. On the contrary, where the effusion of fluids into the bronchiæ is too great, as in humoral asthma, or in the chronic catarrh to which old people are subject, those expectorants which are more directly stimulant, as the different balsams, and several of the gum resins, as myrrh or ammoniacum, so far as they have any efficacy, or those which promote absorption, as squill or foxglove, will be found more useful. In considering the particular expectorants, they may be arranged as nearly as possible according to these subdivisions.

EXPECTORANTS.

Antimonium.	Allium Sativum.
Ipecacuanha.	Polygala Senega.
Digitalis Purpurea.	Ammoniacum.
Nicotiana Tabacum.	Myrrha.
Scilla Maritima.	Myroxylon Peruiferum.

Toluifera Balsamum.
Styrax Benzoin.
Styrax Officinale.
Amyris Gileadensis.

ANTIMONIUM. Antimony. (Page 174.)

ANTIMONY, it has been already remarked, is in use as an expectorant, and probably operates by its power of removing constriction of the exhalents, and thereby favouring the effusion of fluid into the mucous cells of the lungs, when from an inflammatory state this secretion had been suppressed. It of course then apparently causes expectoration. Of the preparations of it which have been employed as expectorants, the principal are the hydro-sulphuretted oxide, and the tartrate of antimony and potash. The first, under the forms of what are named kermes mineral, and precipitated sulphuret of antimony, was at one time celebrated as a remedy in pertussis and in pneumonia, in a dose of from 5 to 10 grains; but being uncertain in its strength, has fallen into disuse. The tartrate of antimony and potash is used in the same cases, and in some forms of asthma and catarrh, in the dose of one-eighth of a grain, repeated every second or third hour. It is also frequently combined with squill and other expectorants, to promote their operation.

IPECACUANHA. Ipecacuan. (Page 180.)

IPECACUAN, operating in the same manner nearly as antimony, has like it been used as an expectorant in a dose of two or three grains. It is, however, less frequently employed. Advantage is sometimes derived from it in this dose continued for some time in chronic asthma.

DIGITALIS PURPUREA. Foxglove. (Page 92.)

DIGITALIS is employed with advantage in humoral asthma, dyspnœa aquosa, and in catarrhus senilis, obviously from its power of promoting absorption, by which it removes the fluid accumulated in the lungs from diminished action of the absorbents. By diminishing the quantity of this fluid, it facilitates the expectoration of the remainder; it hence appears to act as an expectorant, and relieves the difficulty of breathing, and the irritation to which this accumulation gives rise. In such cases, it is proper to give it rather in small doses, than to push its operation to any great extent; a grain of the dried leaves, twenty drops of the tincture, or half an ounce of the infusion daily, will be a sufficient dose.

NICOTIANA TABACUM. Tobacco. (Page 95.)

TOBACCO has been celebrated as an expectorant in chronic catarrh and humoral asthma, under the form of the watery extract, the dose of which is two or three grains. Its general action being similar to that of foxglove, it probably operates in these morbid affections on the same principle, though it is much inferior in efficacy.

SCILLA MARITIMA. Squill. (Page 182.)

SQUILL, the history of which has been given as a diuretic, is one of the principal expectorants. It is used more peculiarly in those cases where there is an accumulation of the pulmonary mucus; hence it probably operates by its power of promoting absorption, diminishing the quantity of fluid effused, and thus facilitating the expectoration of the remain-

der. By stimulating the exhalents of the lungs, where they are in a debilitated state, it may also lessen the secretion where it is too abundant. In inflammatory states of the system, where, from constriction of the pulmonary vessels, the exhalation is diminished, it is less useful; it has even, from its acrimony and stimulating quality, been considered injurious in pneumonia, unless when the state of active inflammation has subsided, or when its stimulating operation is diminished by combination with nitre, or with tartrate of antimony. As an expectorant, it is also used in pertussis, and when the removal of that disease is attempted by exciting vomiting at intervals, it is the emetic usually prescribed. In all these cases it is used under the form of the vinegar or the syrup of squill, the dose of the former being half a drachm, of the latter a drachm, repeated every third or fourth hour, with the view of promoting expectoration, or considerably larger when it is intended to produce vomiting. The squill pill is used in chronic catarrh, in a dose of 10 grains daily.

Allium Sativum. Garlic. *Hexand. Monogyn. Liliaceæ. Radix. South of Europe.*

The bulbs of the root of this plant have, when recent, a fœtid smell and acrid taste. By being long kept, they become shrivelled and inert. Their taste and smell are extracted by water by infusion; by decoction they are nearly lost. By distillation they afford an essential oil odorous and acrid.

Garlic has an analogy to squill in its qualities and operation: it acts as a diuretic, diaphoretic, and expectorant; hence its use in dropsy, rheumatalgia, and humoral asthma: it has also been employed in the treatment of intermittent fever; and as a stimulant in dyspepsia. Its dose is half a drachm or 2 scruples, swallowed whole, or made into pills with soap. A syrup prepared by digesting it in vinegar, and boiling the liquid with the due proportion of sugar, has been used as an expectorant. Externally, garlic bruised is used as a stimulant and rubefacient: it is applied to the soles of the feet, to relieve coma in fever; its juice is sometimes introduced into the ear in cases of deafness.

Offic. Prep.—Syr. Alii. *Dub.*

Polygala Senega. Seneka. Rattlesnake-root. *Diadelph. Octand. Lomentac. Radix. North America.*

This root is in articulated shoots, of a greyish yellow colour; its taste is bitter and pungent. Its active matter is extracted principally by water with the assistance of heat, and completely by alcohol.

Seneka has been employed as an expectorant in pneumonia, after the highly inflammatory stage of the disease has been subdued, and also in pertussis and chronic catarrh. Its dose in substance is from 10 to 20 grains, but it is generally used in the form of decoction, of which, when prepared according to the formula of the Edinburgh College, an ounce, or an ounce and a half, may be given every second or third hour. As it operates also as a diuretic, it is probable that its efficacy depends on its power of increasing absorption, and hence that it is more adapted to those cases where there is an accumulation of fluid in the bronchiæ, than to affections of an opposite nature. It is however little used.*

* In this country the Seneka is a much more popular article than it appears to be in Europe from the representation of our author. As a remedy in croup particularly, it has long sustained with us a very high character, and it is also in common use in many of

Offic. Prep.—Dec. Polygal. Seneg. *Ed. Lond.*

Ammoniacum. Ammoniac. Heracleum Gummiferum. *Pentand. Digyn. Umbellatæ. Gummi-resina.*

This gum-resin is brought from Egypt and the East Indies; the tree which produces it has not been accurately described. Wildenow, however, succeeded in raising, from the seeds often found mixed in the gum-ammoniac of the shops, a vegetable which he has described, and named Heracleum Gummiferum; and the London College have, on his authority, inserted it as the plant which affords ammoniac. It appears that the gum-resin is yielded by exudation. It is in large masses, or, when of the best quality, in round fragments, yellow on the surface, and white within. It has a faint smell, and a nauseous taste. It is partially soluble in alcohol. Water triturated with it forms a milky-like mixture, from which a resinous matter subsides. The following are its constituent parts, according to the analysis of Braconnot: resin 70.0, gum 18.4, glutinous matter 4.4, water 6.0, loss 1.2=100.0.

Ammoniac is principally employed as an expectorant, and is sometimes prescribed in asthma and chronic catarrh, probably with little benefit. Its dose is from 10 to 20 grains, given under the form of pill, or diffused in water, and frequently combined with squill or tartrate of antimony. Sometimes it is used as an emmenagogue, combined with myrrh, or with preparations of iron. Externally it is applied as a discutient, under the form of plaster, to white swelling of the knee, and to indolent tumors, being beat into a soft mass with vinegar, and spread on leather.

Offic. Prep.—Emp. Amm. Emp. Ammon. cum. Hydr. *Lond.*—Mist. Ammon. *Lond. Dub.*

Myrrha. Myrrh. *Gummi-resina.*

Myrrh is the produce of Arabia and Abyssinia; the plant from which it is obtained has never been accurately described. It is in small pieces of a reddish-brown colour, has a smell rather fragrant, and a warm bitter taste. It consists of gum and resin; the latter appearing to constitute its active matter. Alcohol dissolves the resin, and the solution is rendered turbid by the affusion of water. Water boiled on myrrh dissolves the mucilaginous matter, to which part of the resin adheres, and this evaporated affords the watery extract, which is less active than the myrrh itself. According to Pelletier, myrrh is composed of 67 parts of gum, and 33 parts of resin, containing some volatile oil.

Myrrh is an expectorant which has been regarded as too stimulating to be employed in pneumonic inflammation, but which has been often employed in asthma and chronic catarrh, and sometimes in phthisis where there is little tendency to inflammatory action. Its dose is from 10 to 20 grains: and to lessen its stimulating operation, it is not unfrequently combined with nitre, or with super-tartrate of potash. The watery extract, which has been preferred by many physicians to the myrrh itself, and

the forms of pneumonic inflammation. From its very stimulating character it is evident that it can only be administered with safety in the secondary stages of these diseases, after bloodletting and other evacuations have been liberally premised. The best form in which it can be given is that of decoction, prepared from ℥ss of the bruised root boiled in ℥viij of water down to ℥iv. In croup, a tea-spoonful of this may be given every hour or half hour, according to circumstances. It is proper to state that Dr. Archer of Maryland first suggested this practice. *Ed.*

which is a form under which it has been used in phthisis, seems to be an injudicious preparation, as the myrrh is merely weakened in power. Myrrh is also sometimes employed in amenorrhœa, usually combined with iron. Its tincture is in common use as a stimulating application in sponginess of the gums, and sometimes also to foul ulcers.

Offic. Prep.—Tinct. Myrrh. *Ed. Lond. Dub.*—Tinct. Aloes et Myrrhæ. *Ed.*

Myroxylon Peruiferum. Balsamum Peruvianum. Peruvian Balsam. *Decand. Monogyn. Lomentaceæ. South America.*

This balsam is said to be extracted by boiling the bark and young branches of the tree with water; it has also been affirmed that it is obtained by exudation. It is thick and viscid, of a reddish-brown colour, has a strong smell somewhat fragrant, and a bitter pungent taste. It affords a small portion of essential oil by distillation, and of acid of benzoin by sublimation. Its remaining matter is resinous. It is entirely soluble in alcohol.

Peruvian balsam is considerably stimulant. It has been employed as an expectorant in catarrh and dyspnœa, more particularly in those forms of these diseases where the secretion of pulmonary mucus is increased; and from its stimulating action on the stomach, or from a similar action on the exhalents or absorbents of the lungs, may be attended with advantage. It has also been prescribed as a remedy in paralysis, chronic rheumatism, and leucorrhœa. Its dose is from 5 to 15 grains, and it is best given diffused by mucilage, or made into pills by any vegetable powder. Its tincture is employed as a stimulating application to foul ulcers.

Toluifera Balsamum. Balsamum Tolutanum. Balsam of Tolu. *Decand. Monogyn. Lomentaceæ. South America.*

Tolu balsam is obtained from incisions in the trunk of the tree; it thickens and becomes concrete, and of a resinous fracture and appearance; it is of a brown colour, has a fragrant odour, and a warm sweetish taste. It dissolves entirely in alcohol, and communicates its odour and taste to water by boiling. It contains a small quantity of acid of benzoin, which is expelled from it by heat.

This is the mildest of all the balsams. It has been used as an expectorant, and its tincture or syrup sometimes enters into the composition of mucilaginous mixtures used in catarrh, but its powers are very inconsiderable, and it is employed principally on account of its flavour.

Offic. Prep.—Tinct. Toluif. B. *Ed. Dub.*—Syrup. Tolutan. *Lond.*

Styrax Benzoin. Benzoinum. Benzoin or Benjamin. *Decand. Monogyn. Bicornes. Balsamum. India.*

The tree which affords the concrete balsam named Benzoin, is a native of Sumatra. It yields it by exudation from incisions which are made in the bark of the stem. Benzoin is in brittle masses, composed of brown and white fragments; its smell is fragrant; it has little taste. It consists almost wholly of resin, and is therefore nearly entirely soluble in alcohol. It likewise contains a considerable portion of that peculiar acid, which, as it exists in greater quantity in it than in any other vegetable matter, is named Benzoic acid. This is obtained from it by sublimation, or by decoction with water, and likewise by boiling it with potash or lime, with either of which it combines, and is afterwards separated by the addition of an acid.

It is in white brilliant scales, retains the flavour of the benzoin, and with acidity has likewise a degree of pungency.

From 1500 grains of Benzoin, analysed by Bucholz, 1250 of resin were obtained, 187 of benzoic acid, 25 of a substance resembling the balsam of Peru, 8 of an aromatic substance, soluble in water and alcohol, and 30 of woody fibre and impurities. When nitric acid is added to it, a quantity of artificial tannin is formed.

Benzoin is rarely employed in medicine. Its acid has been prescribed as an expectorant in asthma, in a dose of 10 or 15 grains; but is a medicine of little power. It enters into the composition of the ammoniated and camphorated tinctures of opium, and is scarcely applied to any other use.

Offic. Prep.—T. Benz. C. *Ed. Lond. Dub.*

STYRAX OFFICINALE. Storax. *Decand. Monogyn. Bicornes. Balsamum. South of Europe, Asia.*

THE resinous juice afforded by the Storax-tree, from incisions in the bark of the stem, is, in the state in which it is imported from the Levant, very impure, from the intermixture of saw-dust, and sometimes of earthy matter. It is in masses soft and slightly unctuous, of a brown colour, with scarcely any resinous appearance; it retains, however, a strong fragrant odour, and has a bitterish pungent taste. It consists principally of resin, with a small portion of benzoic acid. It resembles benzoin in its virtues; was formerly used as an expectorant, but is now little regarded.

Offic. Prep.—Styrax Purif. Pil. Styrac. *Dub.*

AMYRIS GILEADENSIS. Balsamum Gileadense. Balsam of Gilead. *Octand. Monogyn. Dumosæ. Arabia.*

THIS balsam is obtained from incisions made in the bark of the trunk of the tree; it is in the form of a milky juice, highly fragrant, and is so much valued in the East, that it is said not to be imported into Europe. A coarser kind is obtained by strong decoction of the branches and leaves, of a yellow colour and thick consistence; its taste is warm and bitter; and its flavour is fragrant. What is met with in the shops, under the name of Balsam of Gilead, is a resinous juice, having none of these qualities, and probably the produce of a different plant. It seems little superior to the finer kinds of turpentine.

The medicinal virtues of the genuine balsam of Gilead have been highly extolled, undoubtedly with much exaggeration. Even the inferior balsam, that said to be procured by decoction, is not easily procured, so that it is never used in European practice; but its qualities seem to be similar to those of the balsam of Peru, with more acrimony.

CHAP. XIII.

OF SIALAGOGUES.

SIALAGOGUES are those medicines which increase the salivary discharge. This may be effected either by the mastication of substances, which, by their acrimony and pungency, excite the action of the vessels which se-

crete the saliva, or by the internal exhibition of certain medicines. Of the latter, mercury is the only sialagogue; and such is the certainty of this operation of it, that all its preparation, when administered in certain quantities, produce salivation to a greater or less extent.

As a class of remedies, sialagogues are of little importance. The sialagogue operation of mercury, it has already been remarked, does not appear essential to its efficacy in any disease, but is regarded merely as a test of the mercury acting on the system. The acrid sialagogues, which are applied locally, by increasing the secretion of saliva, and by their pungency, sometimes relieve the pain of toothach; they have been supposed useful, by the derivation they occasion, in some kinds of headach; and their pungency has been believed to operate with some advantage in paralysis of the tongue, or of the muscles concerned in deglutition.

SIALAGOGUES.

Hydrargyrus.	Daphne Mezereum.
Anthemis Pyrethrum.	Amomum Zingiber.
Arum Maculatum.	Nicotiana Tabacum.
Cochlearia Armoracia.	

HYDRARGYRUS. Quicksilver. (Page 109.)

No satisfactory explanation has been given of the peculiarity which mercury, under every form of preparation, has of exciting the secretion of the saliva. Some have remarked, that in consequence of the gravity of this metal, by which, when received into the circulation, it is disposed to retain the "direct line in which it is propelled from the heart, it is more certainly determined to the vessels of the head," a solution of the difficulty which is altogether absurd. It has likewise been supposed to act by lessening the consistence of the blood, and disposing it to pass more easily into the salivary glands, so as to increase their secretion,—an opinion equally gratuitous and imperfect. Dr. Cullen endeavoured to solve the problem, by supposing that mercury has "a particular disposition to unite with ammoniacal salts, and that such salts are disposed to pass off by the salivary glands more copiously than by any other excretion." But mercury has no peculiar tendency of this kind; and if it had, these salts are not more abundant in the saliva, than in some other secretions. If another hypothesis might be hazarded, the following perhaps may afford some explanation of this singular property. The urine appears more peculiarly designed to convey matter which has been received into the circulating mass, but which is excrementitious, from the system. To pass with this fluid, it is necessary that the matter conveyed should be dissolved; and when it is so, we can discover it in the secretion by chemical tests. If there is any property connected with it which shall prevent this solution, this probably will prevent its secretion. Now, the phosphoric acid which is abundant in urine, must in this mode counteract the secretion of mercury in any form of preparation, by forming with it a compound insoluble, and to which the slight excess of acid cannot communicate solubility. The mercury, therefore, when brought in the course of the circulation, to the secreting vessels of the kidneys, will not pass through their whole course, but if conveyed so far as to be combined with the phosphoric acid which is secreted, will, from this combination, be incapable of being con-

veyed onwards, but will be retained in the composition of that part of the blood which does not enter into the secretion, and return into the circulation. It must be discharged by some other emunctory; a portion of it appears to pass off by the insensible perspiration; but the tenuity of this secretion, if the term may be employed, must be unfavourable to this mode of discharge. The salivary secretion is one by which it may be more easily transmitted, and this transmission may even be facilitated by the affinity exerted to the oxide of mercury by the muriatic acid, the soda and ammonia, which are the chief saline ingredients in saliva; for it deserves to be remarked, that triple compounds of these substances,—a soda-muriate, and ammoniaco-muriate of mercury,—are to a certain extent soluble in water. If the mercury is thus secreted, it will of course stimulate the secreting vessels through which it passes, and increase the salivary discharge.

The increase in this discharge, effected by mercury, is attended with pain and sense of heat in the mouth, with softness and swelling of the gums, or even slight ulceration; sometimes with considerable swelling, extending over the throat and face. These effects, when excessive, are best checked by the use of opium, of purgatives, of a blister applied to the throat, and, as Mr. Pearson has recommended, free exposure to a cool dry air. From theory, the administration of sulphur, or sulphuret of potash, has been recommended.

The remaining Sialagogues act by topical application.

Anthemis Pyrethrum. Pellitory of Spain. *Syngenes. Polygam. superfl. Compositæ. Radix. South of Europe.*

This plant is cultivated in this country, but the root found in the shops is generally imported from Spain. Its taste is hot and acrid, its acrimony residing in a resinous principle, which alcohol dissolves, forming a very acrid tincture. It is a remedy which, from stimulating the salivary glands and exciting a discharge of saliva, is used in toothach, and sometimes gives relief. It has also been chewed in palsy of the muscles of the throat.

Arum Maculatum. Wake-Robin. *Gynand. Polyand. Piperitæ. Radix. Indigenous.*

The root of this plant when recent, is extremely acrid; by drying, its acrimony is much impaired. In chewing it, it impresses at first a sense of sweetishness, but soon afterwards of acrimony on the tongue; and applied moist to the skin, it inflames or excoriates it. In digesting it with alcohol, or with water, and evaporating either solution, an extract is obtained less acrid than the root itself, the vapour condensed has not much acrimony, and hence the principle in which this property resides appears to be one easily decomposed. By merely washing the root, too, the acrid matter is removed, and a mild fecula is obtained. Arum resembles pellitory, and may be applied to the same purposes, but its pungency is unpleasant. Internally, it has sometimes been used as a stimulant in palsy and rheumatism.

Cochlearia Armoracia. Raphanus Rusticanus. Horseradish. *Tetradyn. Silic. Siliquosæ. Radix. Indigenous.*

The root of this plant, when recent, has a penetrating taste, with a degree of sweetness. It excites, when chewed, a sense of heat, and a dis-

charge of saliva. Its pungency resides in an essential oil, and is lost by drying. Water and alcohol may be impregnated with it, but it is lost by boiling; and by distillation with water, a portion of oil is procured, pungent and acrid.

Horse-radish is a stimulant which, as a sialagogue, has been used in paralysis of the tongue. It has also been used internally in paralysis and rheumatism as a stimulating diaphoretic, in asthma as an expectorant, and in dropsy as a diuretic. Its dose is about a drachm of the recent root cut in small pieces, and swallowed entire. Externally it has been applied as a rubefacient, and its syrup has been used as a remedy for hoarseness.

Offic. Prep.—Infus. Armorac. Comp. *Lond.*—Spir. Armorac. Comp. *Lond. Dub.*

Daphne Mezereum. Mezereon. (Page 230.)

The bark of the root of mezereon has a considerable degree of acrimony, so that when chewed it impresses a sense of heat and irritation in the mouth and upper part of the throat, and excites the salivary discharge. A case of paralysis of the muscles of the throat, causing difficulty of swallowing, is related by Withering, in which, from chewing frequently small pieces of mezereon, a cure was obtained.

Amomum Zingiber. Ginger. (Page 149.)

Ginger-root, from its pungency, excites, when masticated, a sense of heat and increased discharge of saliva, and is sometimes, like other sialagogues, employed to remove the pain of toothach.

Nicotiana Tabacum. Tobacco. (Page 95.)

Tobacco, when chewed, increases the action of the salivary glands, and the same effect is produced in the usual method of smoking it. Partly from this, and partly from its narcotic operation, exerted at the same time to a certain extent, it sometimes relieves, especially in the latter mode of using it, the pain of toothach, or of earach.

CHAP. XIV.

OF ERRHINES.

Errhines or Sternutatories, are substances which occasion a discharge from the nostrils, of a mucous or serous fluid. They operate by direct application, and generally in consequence of a slightly acrid quality. Any substance in fine powder snuffed up the nostrils has this effect in a certain degree; but it is, as is to be expected, more copious as the substance is more acrid or stimulating. The discharge, as produced by different errhines, varies in extent, and in the time during which it continues. Some also occasion a sense of heat, or even inflame the membrane to which they are applied, while others have no such effects.

It is evident, that the effects of this class of remedies must be very limited, as applied to the treatment of disease. By the evacuation they oc-

casion, it has been supposed that they diminish the quantity of fluid circulating in the neighbouring vessels; hence they have been inferred to be useful in rheumatic affections of the muscles of these parts, and in toothach. It has even been supposed, that their effects may extend to all the branches of the external carotid, and Dr. Cullen mentions, that he has, apparently from this operatio , known headach, pain of the ear, and some cases of ophthalmia, cured or relieved by the use of errhines. He has likewise supposed, that they may have been of use in preventing apoplexy or palsy: this at least should, he remarks, be so far attended to, that when any approach to these diseases is suspected, the drying of the mucous discharge should be attended to, and if possible obviated.

ERRHINES.

Iris Florentina.	Asarum Europæum.
Æsculus Hippocastanum.	Veratrum Album.
Origanum Majorana.	Nicotiana Tabacum.
Lavandula Spica.	Euphorbia Officinalis.
Rosmarinus Officinalis.	Sub-Sulphas Hydrargyri.

Iris Florentina. Florentine Orris. *Triand. Monogyn. Ensatæ. Radix. South of Europe.*

The root of this plant, freed from its outer bark, is of a white colour, has a pleasant odour, and slightly bitter taste. It is a mild sternutatory, and enters into the composition of some cephalic snuffs.

Æsculus Hippocastanum. Horse-Chesnut. *Heptand. Monogyn. Trihilatæ. Semen. Cortex. North of Asia.*

The fruit of this tree is principally farinaceous; and this farina acts as a sternutatory. The bark is bitter, and has been proposed as a substitute for Peruvian Bark.

Origanum Majorana. Sweet Majoram. *Didynam. Gymnosperm. Verticillatæ. Herba. South of Europe.*

The leaves of this herb have an aromatic odour, and when dried and reduced to powder, a slight errhine power.

Rosmarinus Officinalis. Rosemary. *Diand. Monogyn. Verticillatæ. Summitates florentes. South of Europe.*

The flowers and flowering tops of this plant have a fragrant odour, which resides in an essential oil. It is used as a stimulating perfume, under the form of the distilled spirit, and the powder is sometimes mixed with other errhines.

Offic. Prep.—Ol. Rorism. Spirit. Rorism. *Lond. Dub. Ed.*

Lavandula Spica. Lavender. *Didynam. Gymnosperm. Verticillatæ. Spicæ florentes. South of Europe.*

Lavender is cultivated in our gardens. Its flowers have a fragrant smell, and a warm bitterish taste. They yield a quantity of essential oil, which is employed in medicine as a stimulant, when combined with alcohol, and other aromatics, under the form of what is named Compound

Spirit of Lavender. The simple spirit or solution of the oil in alcohol is used as a perfume, and the dried leaves in powder are errhine.

Offic. Prep.—Spir. Lavand. Spirit. Lav. C. Ol. Lavand. *Ed. Lond. Dub.*

Nicotiani. Tobacco. (Page 95.)

The leaves of tobacco are in common use as an errhine; their powder forming the different kinds of snuff.

Asarum Europæum. Asarabacca. *Dodecand. Monogyn. Sarmentaceæ. Folia. Indigenous.*

This plant has been already noticed as an emetic, but is now retained in the Pharmacopœias only as an errhine. Its leaves possess rather more errhine power than those hitherto noticed, while they are less acrid than some other substances belonging to this class. They are on the whole, therefore, best adapted to the purposes which errhines serve, and are hence employed as the basis of the officinal sternutatory powders.

Offic. Prep.—P. Asar. Europ. C. *Ed.*

Veratrum Album. Helleborus Albus. White Hellebore. *Polygam. Monoec. Liliaceæ. South of Europe.*

The root of this plant has a strong disagreeable smell when fresh, which is lost by drying, and an acrid taste, which is retained. Snuffed up the nostrils in a very small quantity, it excites violent sneezing, with a sense of heat, and a copious discharge of thin mucus. It is therefore sometimes used as a sternutatory, mixed with some of the milder and more fragrant errhines. Taken internally, in a dose of a few grains, it acts as a violent emetic and cathartic. Externally, when mixed with lard, so as to form an ointment, or in the form of decoction, it is used as an application in psora and some other cutaneous diseases.

It contains an alkaline element, lately discovered by M. M. Pelletier and Caventou, who have given it the name of *Veratria*, or Veratrine. It appears to exist in the seed, combined with gallic acid: it is in the form of a white powder, inodorous, very soluble in alcohol, but scarcely so in water; at 122° it melts, and has the appearance of wax; the salts it forms with the acids are uncrystallizable by evaporation, and present the appearance of gum.

Veratria, given in very small doses, produces violent vomiting; and according to some, a few grains of it act as a powerful poison.

Offic. Prep.—T. Verat. A. *Ed.*—Vin. Verat. Dec. Verat. Ungt. Verat. *Lond.*—Ung. Helleb. A. *Dub.*

Euphorbia Officinalis. *Dodecand. Trigynia. Gummi-resina. Africa.*

This substance, which is of a resinous nature, is said to be obtained by exudation from incisions in the branches of the plant producing it, a native of different countries of Africa: it is usually imported from Barbary. It is in small fragments, having scarcely any smell, but a very acrimonious taste. Its operation as a drastic purgative is so violent, that it is never given internally. Its powder is the most violent of all the errhines, occasioning a copious discharge of mucus, with a sense of heat, and sometimes hæmorrhage or inflammation. Hence it is scarcely ever employed. Externally it is used as a rubefacient or vesicatory.

Sub-sulphas Hydrargyri. Sub-sulphate of Mercury.

This preparation of mercury is an errhine, and has been employed in chronic ophthalmia and amaurosis; one grain of it being mixed with a few grains of any mild vegetable powder, and snuffed up the nostrils occasionally.

CHAP XV.

EPISPASTICS AND RUBEFACIENTS.

Epispastics and Rubefacients operate nearly on the same principle, and produce similar effects, differing only in degree. They may therefore be considered as subdivisions of one class.

The term Epispastic has been applied to whatever application has the power of producing a serous or puriform discharge, by exciting a previous state of inflammation or suppuration. The term includes blisters, issues, and setons; but it is more commonly restricted to the first of these, and it is this which chiefly falls under the department of Materia Medica.

Blisters are those external applications which by their acrimony excite inflammation on the skin, and which occasioning a thin serous fluid to be poured from the exhalents, separate the cuticle from the true skin, and form the appearance of a vesicle or blister.

The mode in which they produce this effect is sufficiently evident; it is to be referred to the stimulating power of the substances applied, which, exciting increased action in the extreme blood-vessels, induces inflammation, and causes the pouring out of the serous fluid with which the vesicle is filled. Hence may be deduced the primary effect of these applications on the general system. By the increased action they excite, and the pain they occasion, they act as stimulants, and they may also act, it has been supposed, as evacuants, by the quantity of fluid which they cause to be poured out.

There can be little dispute by which of these modes of operation blisters are used with advantage in the treatment of diseases. The quantity of fluid discharged is so inconsiderable, while the relief obtained is often so sudden and complete, that it would be assigning a very inadequate cause for their effects, if we should ascribe these to any evacuating power.

Some have imagined that the substance of cantharides, which forms the basis of the common blistering applications, is absorbed in part by the inflamed surface, and that it is to the peculiar action of this acrid matter stimulating the system, that many of the effects of blisters are owing. But there is no proof, nor indeed any reason to believe, that this absorption is uniform or frequent: the same effects are obtained from blistering applications into the composition of which cantharides do not enter, while they are not obtained from the internal administration of cantharides. The effects of blisters are therefore to be ascribed to the pain and inflammation they excite in the part to which they are applied, and the stimulus which is thence propagated to the general system.

It is a principle with regard to the living body, demonstrated by many facts, that where a morbid action exists, it may be often removed by inducing a different action, even of a morbid kind, in the same part, or in

parts as contiguous to it as possible ; and where the morbid action extenps to the whole system, it may be removed by one of a different kind being excited either generally, or in any particular part of the body.

From this principle is explained the efficacy of blisters in all cases of inflammation and of spasmodic constriction ; a new inflammation being excited by the blister which occasions derivation of action. Hence, too, the advantage obtained is greater when the blister is applied as near as possible to the part affected. This principle regulates the application of blisters in pneumonia, hepatitis, phrenitis, angina, ophthalmia, rheumatism, and every other case of active inflammation. In these affections, blisters are used with very evident advantage ; the local inflammation which is excited more than counterbalancing, by this operation, the stimulant effects at the same time produced.

A similar principle exists with respect to the pain excited by blisters, which may be applied to the explanation of the advantages derived from them in other diseases. It has long been remarked, that exciting one pain often relieves another, and hence blisters afford relief in toothach, and other painful affections. Epilepsy and hysteria arising from irritation have been removed by blisters: apparently from their exciting pain, engaging the attention, and diminishing the sensibility to the morbid irritation.

Lastly, blisters exert a stimulant operation on the general system, and raise the vigour of the circulation. Hence their utility in fevers of the typhoid kind, where extreme debility prevails. From their peculiar operation, too, they are the only remedy that can be used to obviate the local inflammation of the brain, or other parts, that sometimes exists in fevers of this kind, as they contribute to resolve it without reducing the strength of the system.

It is also from their stimulating power, and perhaps from exciting pain, that blisters are of advantage in apoplexy and paralysis.

Rubefacients operate precisely in the same manner as blisters ; they excite pain and inflammation, but only in an inferior degree ; the skin is merely inflamed, and no vesicle raised so that any fluid shall be discharged. By these effects they more peculiarly obviate local inflammation. They are used, therefore, for the same purposes.

EPISPASTICS AND RUBEFACIENTS.

Meloe Vesicatorius.	Pix Burgundica.
Sinapis Alba.	Elemi.
Allium Sativum.	Ammonia.
Euphorbium.	

Cantharis Vesicatoria. Meloe Vesicatorius. · Lytta Vesicatoria.

The natural history of this substance has been given under the class of Diuretics, to which it belongs. It is a more important article of the Materia Medica as an epispastic, and is the substance, indeed, which is now almost exclusively employed to raise a blister, as it acts with certainty, and is not liable to induce that deep-seated ulceration which sometimes follows the application of other acrid substances that have been used for the same purpose The cantharides in powder is mixed with lard and wax, so as to form a plaster of a proper consistence, which is applied to the part, generally for 16 or 12 hours : at the end of that time, the cuticle is raised, forming a vesicle ; this is then cut, to allow the serous fluid to be discharg-

ed, and the inflamed part is dressed with any mild ointment. The principal circumstance which requires caution in the application of the cantharides plaster, is that determination of action to the neck of the bladder which gives rise to strangury. This is more peculiarly liable to occur where the system is uncommonly irritable, where the blister is large, or where it is applied to a newly abraded surface, as to the head recently shaved; and as it is a very painful affection, not easily removed, care ought to be taken to guard against it. Camphor has been sometimes added to the blistering plaster, with the view of obviating this. But it is doubtful if it has any such effect; the plentiful use of diluents, while the blister is applied, prevents it more certainly, and it is always proper when a blister is applied, especially if large, or in inflammatory diseases, to order the patient to drink freely of any mild diluent liquor. Where the strangury does occur from the application of a blister, it is best relieved by an enema of tepid water, with a little expressed oil, and 40 drops of tincture of opium, and by the use of the warm bath, or warm fomentation.

In some diseases, as in apoplexy, it is of importance to be certain of the operation of an epispastic, and to have its effect produced in a short time.

To attain these, a compound plaster is ordered by the Edinburgh College, Emplast. Cantharid. Vesicat. Comp. in which the stimulating power of the cantharides is increased by the addition of other acrid substances, burgundy pitch, turpentine, verdigrease, mustard, and pepper. In the application of this still more caution is necessary to guard against the occurrence of strangury.

After a blister has been raised, it is often of advantage to convert the serous discharge into one of a purulent nature, by exciting suppuration, or to form what is termed an Issue; this can easily be effected by the application of any acrid stimulating ointment; one composed of wax and oil, with a small proportion of cantharides, is commonly used for the purpose, as, by the irritation it excites, it keeps up the inflammation, and at length produces suppuration. Any foreign body retained on the inflamed part answers the same purpose. What are named Orange Pease, the small unripe fruit of the orange, polished, are usually employed, as by their odour they cover the fœtor of the discharge. One of these is retained on the blistered part by a slip of adhesive plaster, and by the irritation it occasions, keeps up a constant discharge. A seton, or cord introduced by a needle, answers the same purpose. When a puriform discharge is thus established in a part, considerable effects arise from the morbid action which it continues, and the evacuation it occasions. It is a practice often employed with advantage in asthma, paralysis, and a number of chronic affections.*

*"The United States, rich in the articles of the Materia Medica, furnish us with several species of insects, which may be employed as valuable substitutes for the cantharides of the shops. The species commonly called "Potatoe Fly," which is now much employed (and which I have often employed) as an epispastic, is the Lytta vittata of Fabricius: the Cantharis vittata of Olivier. This, during certain seasons, is so extremely common in many parts of the Union, that it might be collected and sold at a much cheaper rate than the foreign cantharides of the shops, to which it is by no means inferior in strength. On the contrary, from frequent employment of the two articles, I cannot hesitate to prefer the American to the foreign fly. Long-keeping, provided it be carefully kept, does not materially impair the blistering property of the Lytta vittata. At the end of three or four years after being collected, I have found it equal in power to the best shop cantharides. This insect, though commonly called the Potatoe-Fly, is frequently met with upon other vegetables of very different natural families, such as garden peas and beans, species of Amaranthus, the Acetæa racemosa (formerly

Sinapis. Mustard. (See page 182.)—The flour of mustard-seed mixed with an equal part of wheat flour or crumbs of bread, and made into a paste with vinegar, forms what is named a Sinapism, an application which acts as a powerful rubefacient. It is applied to the soles of the feet in typhoid fevers, where there is extreme debility, or determination to the head. It is used in the same manner in comatose affections; the application of it in either case being continued for an hour or two. It soon excites a sense of pain, and if applied long produces inflammation.

Offic. Prep—Catap. Sinapeos. *Lond. Dub.*

Allium. Garlic. (See p. 235.)—The bruised root of this plant, applied to the sole of the feet, produces effects similar to those of the sinapism, and is used for the same purpose. It is less powerful, and its odour is ungrateful.

Euphorbium. Euphorbia Officinalis. (Page 243.)

This resinous substance, already considered as an errhine, is a powerful vesicatory. It enters into the epispastic compositions of the farrier, and might be employed, mixed with other epispastics, when it is of importance to obtain the effects of a blister to their full extent speedily and with certainty. As a rubefacient, it has the advantage over cantharides, that from its fusibility, it can be diffused uniformly through the resinous matter which forms the composition of plasters, while cantharides can only be mixed in powder. The action of a rubefacient plaster prepared with it is therefore more equal. Twelve parts of burgundy pitch, or of litharge plaster with resin, with one of euphorbium, forms an excellent rubefacient of this kind

Pix Burgundica. Burgundy Pitch. Resina Pini Abietis. Pinus Abies. *Monoecia Monadelph. Coniferæ.*

This substance is obtained by exudation from incisions made in the trunk of the tree. It is boiled with water; is strained; and when cold forms a concrete resinous matter, retaining a little essential oil. As a rubefacient, it is spread upon leather, and applied to the skin; it excites a slight degree of inflammation, and an exudation of serous fluid, without separating the cuticle, so as to produce a blister. Hence it is less painful in its operation, and the application of it can be continued for a considerable time. It is used with advantage in catarrh, pertussis, and dyspnœa.

mentioned), and others.——Besides this, there are in the United States several other species of the genus Lytta, such as Lytta atrata, Lytta marginata, &c.—1. Lytta atrata (of which I have observed two varieties, differing both in size and in the shades of colour) is an extremely common insect in many parts of North America. It is most commonly found, in the autumn, upon different species of syngenesious plants, such as Asters, Solidago, &c. Though inferior in power to the Lytta vittata, it is well worthy of the attention of physicians, and may always, I think, be collected in quantity nearly sufficient to answer the demand of the practitioner.—2. Lytta marginata of Fabricius (the Cantharis marginata of Olivier) is much less common: but it is more powerful than either of the preceding species.—3. Lytta cinerea is also very powerful, but not common; at least within the field of my explorations. The blistering property of these two insects is so very great, that the discovery of them, in large quantities, would be a matter of great importance to the interests of medicine. Though they inhabit (one of the species, in particular) plants of a very acrid nature, it does not appear, that from this source they derive *much*, if any, of their peculiar power: for I find that these insects exert equally energetic effects upon the human skin, when they have been confined entirely to a diet of vegetables of a very mild nature, such as the legumina," &c. (Barton's Collections for an Essay towards a Materia Medica of the United States, p. 22.) *Ed.*

Offic. Prep.—Emp. Pic. Burg. *Dub.* Emplastr. Pic. Compos. *Lond.*

Elemi. Amyris Elemifera. *Octand. Monogyn.*

This resinous substance is obtained by exudation from incisions which are made in the bark of the tree. It is in large masses of a greenish colour, has an odour slightly fragrant, and a warm bitterish taste. It is used to promote the purulent discharge from an issue, and as a stimulating application to foul ulcers, under the form of an ointment which is officinal in the London and Dublin Pharmacopœias.

Offic. Prep.—Unguent. Elemi. Compos. *Lond. Dub.*

Ammonia. Ammonia. (Page 180.)

The solution of ammonia in water of the usual strength, (Aq. Ammoniæ), applied to the skin, acts as a rubefacient. The common form under which it has been employed, is combined with expressed oil, with which it forms a thick spontaneous compound, (Oleum Ammoniatum), formerly known by the name of Volatile Liniment A piece of flannel moistened with this, and applied to the skin, soon excites superficial inflammation. It is often employed instead of a blister to the throat, in angina tonsillaris, being less painful, yet frequently effectual. It is also applied by friction to relieve the pain of rheumatism.

Offic. Prep.—Ol. Ammon. *Ed. Dub.*

[Acidum Nitricum. Nitric acid.

From the certainty and rapidity with which it operates, nitric acid may be esteemed one of our most efficient means of exciting vesication. It was first introduced into practice a few years ago in the East Indies, where it was very successfully used in the treatment of the spasmodic cholera which prevailed epidemically in that quarter of the globe. Since then its use has been extended to other diseases in which it is found necessary to produce prompt and powerful counter-irritation. It is found to be particularly useful in all those cases in which venesection is inadmissible. In applying it, the acid may be used either pure or diluted with one third water. With this the surface is to be rubbed, and as soon as pain is produced, the acid is to be neutralized by washing the part with a solution of salt of tartar. The cuticle is now easily detached, and the cutis left raw. If it is found desirable to continue the irritation, a common blister may after this be laid upon the part.* B.]

THIRD DIVISION.—OF CHEMICAL REMEDIES.

Under this division are comprised those few classes of medicines, the operation of which either depends on the chemical changes they produce, or is materially modified by these changes. I have placed under it the classes of Escharotics, Antacids, Lithontriptics, and Refrigerants.

* See Edinburgh Medical and Surgical Journal, No. 65.

CHAP. XVI.

OF ESCHAROTICS.

Escharotics are substances which erode or dissolve the animal solids. This they do, either by combining with the animal matter, and forming a soft pulp, or a species of eschar, or by resulting affinity, causing the elements of the soft solids to enter into new combinations, whence their cohesion is subverted, and their composition is changed. In both cases the life of the part is destroyed. They are employed principally to remove excrescences, to establish an ulcer, or to change the surface of an ulcerated part, converting it into a simple sore; and the principal distinction among them is that founded on the energy of their action,—some eroding merely the cuticle or external surface to which they may be applied, as nitrate of silver, or sulphate of copper; others, as potash, producing the decomposition of the animal matter to a much greater depth. The action of some of them too, that of arsenic for example, appears to be so far specific, that effects are obtained from their operation, not easily obtained from the others.

ESCHAROTICS.

Acida Mineralia.	Sulphas Cupri.
Super-Sulphas Aluminæ et Potassæ.	Acetas Cupri.
Potassa.	Murias Hydrargyri.
Nitras Argenti.	Sub-Nitras Hydrargyri.
Murias Antimonii.	Oxidum Arsenici Album.
	Juniperus Sabina.

The Mineral Acids act rapidly as escharotics, especially the sulphuric and nitric acids; but from their fluidity, they can seldom be conveniently applied.

Super-sulphas aluminæ et potassæ. Alumen. Alum. (Page 158.)

Alum, from its excess of acid, has an escharotic power; and under the form of dried alum, in which its water of crystallization is expelled, is used in fine powder, to check the growth of fungous excrescences from ulcers. This powder, rubbed with a little sugar, is, from the same property, applied to remove opaque specks from the cornea.

Potassa. Potash. (Page 212.)

Pure potash, in its solid state, forms a powerful escharotic, which has long been in use under the name of Causticum Commune Acerrimum. When its solution, before being evaporated entirely to dryness, is mixed with a portion of lime, its operation is rendered rather weaker; this preparation is named Causticum Commune Mitius, *vel* Causticum Commune cum Calce. Either of them is made into a paste with soap, and is applied to the part, being covered by a slip of adhesive plaster. This application is frequently employed to establish an ulcer, and sometimes in preference to incision to open a tumor: its action is attended with a considerable degree of pain, and a sense of burning heat; after it is removed, a

cataplasm is applied, by which this is relieved, and suppuration is established. Mr. Simmons has recommended potash in preference to other escharotics, to prevent the effects from the bite of a rabid animal; it is applied freely to the bitten part: and the preventative operation of excision, he has supposed, may be rendered more certain by touching the surface with potash.

NITRAS ARGENTI. Nitrate of Silver. Causticum Lunare. Lunar Caustic.

THIS preparation is obtained by dissolving silver in nitric acid, evaporating the solution to dryness, melting the mass by a gentle heat, and while liquid running it into cylindrical moulds, in which, as it cools, it becomes concrete. It is the caustic which is in common use for checking the growth of fungous excrescences, or changing the diseased surface of an ulcer, a little of it being dissolved in as small a portion of water as is sufficient, and being applied by a pencil to the part.

MURIAS ANTIMONII. Muriate of Antimony.

THIS preparation of antimony has been used as an escharotic, but being liquid, it is not easily confined to the part on which it is designed to act, and it has no particular advantage to recommend it.

SULPHAS CUPRI. Sulphate of Copper. Vitriolum Cœruleum. Blue Vitriol. (Page 122.)

THIS salt is a mild escharotic, and from this mildness of its operation is adapted to particular cases. Its solution in water is sometimes employed to change the diseased surface of sores, especially in venereal sores; and either in solution, or in powder mixed with any mild vegetable powder, it is applied to remove specks on the cornea.

SUB-ACETAS CUPRI. Sub-acetate of Copper. Ærugo Æris. Verdigrease. (Page 123.)

THIS preparation is in frequent use as an escharotic, principally to change the surface of foul ulcers, being applied under the form of ointment mixed with lard. In the same form, it is applied as a stimulant in some kinds of ophthalmia. There is an officinal ointment of it, and the oxymel or solution of it in vinegar, with the addition of honey, is another form under which it is used.

Offic. Prep.—Ungt. Sub-acet. Cupr. *Ed. Dub.*—Oxymel Æruginis. *Dub. Lond.*

MURIAS HYDRARGYRI CORROSIVUS. Corrosive Muriate of Mercury. (Page 109.)

THIS preparation of mercury is occasionally employed as an escharotic. Its solution in water, in the proportion of one grain to an ounce, is in particular applied to venereal ulcers. And still more dilute, it is sometimes used as a lotion to herpetic eruptions.

SUB-NITRAS HYDRARGYRI. Sub-nitrate of Mercury. (Page 109.)

THIS, the red precipitate of mercury, as it has been named, has long been in common use as an escharotic, and as a stimulant application to foul and languid ulcers. Reduced to fine powder, it is sprinkled on the part,

or it is applied mixed with lard in the form of ointment; for the preparation of which a formula is given in the Pharmacopœias.

Offic. Prep.—Ungt. Sub-nitr. Hydrargyri. *Dub. Lond. Ed.*

Oxidum Arsenici Album. White Oxide of Arsenic. (Page 123.)

White oxide of arsenic has been frequently employed as an external application to cancer, and though it has been regarded as in some measure specific, its immediate action is that of an escharotic. It was first introduced as an empirical remedy, and was applied, mixed with vegetable matter; a drachm of white arsenic, five scruples of sulphur, an ounce of the leaves of Meadow Crowfoot, and an ounce of Dogs-fennel, being rubbed together, and a little of the powder being made into a paste with the yolk of an egg: this, in a few hours, formed an eschar, by which the diseased surface was changed; and by exciting suppuration by the application of cataplasms, this was thrown off. It has since been used under the form of ointment or solution. The latter has been supposed the least painful form, though perhaps it is not the most effectual. Ten grains are dissolved in one ounce of water, and this solution is applied by a pencil to the sore. It not unfrequently amends the discharge, causes the sore to contract in size, and cases have even been related of its having effected a cure. Violent lancinating pain is sometimes produced by its application; and in some cases, from its continuance, the general system appears to be affected, and symptoms occur indicating affection of the stomach and lungs, which cannot be relieved but by suspending the application. When these appear, the use of the arsenic ought to be stopt: and the effects already stated under the general history of arsenic, (page 124), as produced by its application to a wound, suggest the propriety of employing it with much caution even externally, especially when it is applied to an excoriated surface. Cases are on record, in which, from the too free application of it in this manner, violent constitutional symptoms, with even a fatal termination, have been induced. Still, even with these disadvantages, the benefit derived from the application of arsenic in schirrus and cancer has often been so striking, as to lead to its occasional employment, especially with the view of reducing the size of a cancerous tumour or sore, or in those cases where either the patient will not submit to the operation, or where it cannot be properly performed. The original mode of applying it by cataplasm is probably the most effectual, as changing the whole diseased surface more perfectly.

Juniperus Sabina. Savine. (See page 207.)

The leaves of savine possess an acrid power, whence they are employed as escharotic. The powder sprinkled on warts or excrescences removes them, by what kind of operation is not very obvious. When made into an ointment with lard, it is used as an application to old ulcers, and to some obstinate cutaneous affections: it has also been recommended as superior to any other stimulating application in exciting that degree of suppuration necessary to keep up a purulent discharge from an issue.

Offic. Prep.—Cerat. Sabinæ, *Ed. Lond. Dub.*—Ol. Sabinæ, *Ed. Dub.*

CHAP. XVII.

OF ANTACIDS.

These are remedies which obviate acidity in the stomach by combining with the acid and neutralizing it. The substances most powerful in exerting this kind of action, and which can be employed, are the alkalis, and among the earths magnesia and lime. They are all used both in their pure state and in that of carbonate, the carbonic acid being easily disengaged by the acid in the stomach, and the base therefore exerting its neutralizing power. They can be regarded only as palliatives, the production of the acid being to be prevented by the administration of remedies capable of restoring the tone of the stomach. They are employed in dyspepsia, and in diarrhœa arising from acidity. The principal distinction among them is that some, such as magnesia, form with the acid in the stomach a salt having a purgative effect; others, as lime, a salt apparently inert. They differ also in the degree of neutralizing power; a given weight of ammonia, for example, neutralizes a larger portion of an acid than any other base does; magnesia stands next to it in this respect, then lime, while soda and potash are inferior in power. Magnesia is upon the whole perhaps preferable to any other antacid; it is little inferior to ammonia in power; it is perfectly mild, and from its insolubility, it remains in the stomach, and will continue, therefore, to act, while any portion of it remains uncombined.

ANTACIDS.

Potassa.	Calx.
Soda.	Magnesia.
Ammonia.	

Potassa. Potash. (Page 212, 249.)

This alkali, the chemical characters of which have been already noticed, is obtained from the incineration of the woody parts of vegetables. The ashes are lixiviated, and by evaporation the saline matter, consisting chiefly of sub-carbonate of potash, is procured. This forms the potash of commerce; it is purified by a second solution in water and evaporation; and to procure the alkali, lime is added to the solution of this sub-carbonate; the whole is put upon a filtre, so that the alkaline solution may pass slowly through the mass of lime; the carbonic acid is abstracted by the lime, and the potash passes through in solution, sufficiently pure for any medicinal application. This solution (Aq. Potassæ) is sometimes employed to relieve the symptoms from acidity, where the generation of acid is constant and abundant, being given in a dose of 15 drops diluted in water. Its acrimony renders it, however, an unpleasant remedy. The sub-carbonate is occasionally employed in solution, and the crystallized bi-carbonate, being more mild, has been introduced as a substitute; it has a place in the London Pharmacopœia, and is the best form under which the potash can be prescribed as an antacid; its dose being from ten grains to half a drachm. The super-carbonate (Aq. Super-carbonatis Potassæ) is also often used. It is prepared according to a formula inserted in the Edin-

burgh Pharmacopœia, in which an ounce of sub-carbonate of potash is dissolved in ten pounds of water, and this is combined under a moderate pressure, with an excess of carbonic acid. By this impregnation, the alkaline taste is concealed, and an agreeable pungency communicated. The liquor is taken as an antacid, in the dose of half a pound occasionally; and proves useful in relieving the symptoms connected with acidity in the stomach, not only by the chemical agency of the alkali, but also by the grateful stimulus of the carbonic acid.

Soda. Soda.

This alkali is obtained in the state of carbonate, from the saline matter, formed in the combustion of marine vegetables, the barilla of commerce. In its pure state it is not employed in medicine: the crystallized sub-carbonate is used as a lithontriptic, and as an antacid, in a dose of ten or fifteen grains dissolved in water; the crystallized bi-carbonate, which has a place in the London Pharmacopœia, is more mild and grateful, and may therefore be preferred: it may be given in a dose of from ten to thirty grains. Super-saturated with carbonic acid, under the form of the super-carbonated soda water, it is still more grateful, and is an antacid in common use. It is prepared in the same manner as the super-carbonate of potash, the proportions being so adjusted, that the alkaline strength of each solution is nearly the same. It is therefore taken in the same dose, and is usually preferred to the super-carbonate of potash water, as being supposed to be more mild.

Ammonia. Ammonia. (Page 180, 226.)

The solution of ammonia in water (Aq. Ammoniæ) is sometimes used as an antacid, and it has been recommended by Dr. Sims as superior to the other alkalies in relieving cardialgia, and other symptoms from acidity: so much so, that he has been led to suppose that these symptoms frequently arise, not from the liquid contents of the stomach being acid, but from an elastic fluid, having acidity, on which the ammonia from its volatility more readily acts. From 20 to 30 drops of the solution are given in a cupful of water.

The solution of the carbonate of ammonia is also used in a dose of half a drachm; and the aromatic ammoniated alcohol forms a still more grateful antacid and stimulant.

Calx. Lime. (Page 129, 159.)

Lime, under the form of lime water, (Aqua Calcis), is used as an antacid, in a dose of five or six ounces. It operates, not only chemically, neutralizing the acid, but by its astringent and tonic power contributes to restore the tone of the stomach It is also employed under the form of carbonate of lime, of which there are two varieties in use: the one named by the Edinburgh College Carbonas Calcis Mollior, the other Carbonas Calcis Durior.

Carbonas Calcis Mollior. Creta Alba. White Chalk.

This is a carbonate of lime found abundantly in nature, nearly pure, or containing only minute quantities of other earths. It is soft and earthy, of a white colour. From the grosser impurities with which it is mixed, it is freed by levigation and washing, and is then named Prepared Chalk, (Creta Præparata). This is an antacid in very common use. As the com-

pound it forms with the acid in the stomach has no purgative quality, it is the antacid commonly employed to check diarrhœa from acidity. It is given in a dose of 1 or 2 drachms, with the addition of a small quantity of an aromatic. The chalk-mixture of the Edinburgh Pharmacopœia affords a very good form for administering it.

Offic. Prep.—Pulv. Carb. Calc. Comp. Mist. Carb. Calc. *Ed. Lond.* Pulv. Cret. C. et Opio. *Lond.*—Troch. Carb. Calc. *Ed.*

Carbonas Calcis Durior. Cancrorum Lapilli et Chelæ. Crabs' Stones, Crabs' Claws. Cancer Astacus. Cancer Pagurus. Insecta. Aptera.

In the head and stomach of the river craw-fish, (cancer astacus), are found concretions, consisting principally of carbonate of lime, with a little phosphate of lime and animal gelatin. They are prepared by levigation, and washing with water, and are named Lapilli Cancrorum præparati, formerly Oculi Cancrorum præparati. The tips of the claws of the common sea-crab (cancer pagurus) are similar in composition, and are prepared in the same manner. They are named Chelæ Cancrorum præparatæ. Both are medicinally employed as carbonates of lime, and being prepared with more care, are in general smoother, and more easily diffused in water, than the common prepared chalk, though there is reason to believe, that as met with in the shops, they are merely chalk with a little gelatin. Their dose is the same.

Magnesia. Magnesia. (Page 191.)

Magnesia is usually obtained in the state of carbonate, by decomposing its sulphate or muriate by an alkaline carbonate; and from this, again, the magnesia is obtained in a pure state, by expelling the carbonic acid by the application of heat. In either state it is used as an antacid: the carbonate has the inconvenience, where large quantities of it require to be taken, of occasioning flatulence from the disengagement of its carbonic acid, and this leads to the preference of the pure magnesia, of which also a smaller quantity is required. It is given in a dose of a scruple or half a drachm. The salt which magnesia forms with the acid in the stomach proves slightly purgative; and this is a reason for distinction in practice between this earth and the carbonate of lime; the one being used where diarrhœa accompanies acidity, the other where a laxative effect is wished to be obtained. To obviate the flatulence which it is liable to occasion, or which of itself attends the dyspeptic affections in which it is used, it is advantageously combined with a small quantity of aromatic, as ginger or cinnamon. The preference due to magnesia as an antacid, from its superior power of neutralizing acids, has been stated under the general observations on this class; and also the superior advantage it has from its insolubility, in consequence of which it is not speedily carried forward from the stomach, but remains mixed with the food and exerts all its power. It accordingly appears from the experiments, and the cases related by Mr. Brande, that it is much superior to the alkalies in correcting acidity in the stomach.

CHAP XVIII.

OF LITHONTRIPTICS.

Lithontriptics are medicines supposed to have the power of dissolving urinary calculi; their operation, it is obvious, must be purely chemical.

The alkalis, it has been long known, relieve the painful symptoms arising from these calculi; and being found by experiment capable of dissolving these concretions out of the body, it was concluded that their efficacy depends on their solvent power.

The discoveries of Modern Chemistry have thrown farther light on this subject; it has been proved that these urinary concretions consist frequently of a peculiar acid, the lithic or uric acid, either nearly pure, or in a state of intermixture. With this acid, the alkalis, in their pure state, combine and form a compound soluble in water.

It has been ascertained too, that from the internal administration of the fixed alkalis, the urine becomes so far impregnated as to be sensibly alkaline. Experiments have farther proved, that they may be given even to such an extent, as to enable the urine applied to a caculus out of the body to dissolve part of it; and it appears therefore to follow, that the same solvent power may be exerted on a concretion in the bladder or kidney. Their use, however, to this extent cannot long be persisted in, from the irritation they occasion in the stomach and the bladder; and we have scarcely, perhaps, any proof of a urinary calculus of any considerable size being dissolved.

The use of these agents in a moderate quantity may, however, it has been supposed, prevent the increase of a calculus; and, by allowing the surface to become more smooth, may render it less painful. When the alkalis are thus used as palliatives, they are generally employed in the form of carbonate, or super-carbonate, as in that state they are more mild. Their solvent power is thus impaired; but still they retain the power of preventing the increase of the urinary concretion. The deposition of uric acid, to which that increase is owing, depends in a great measure on the generation of acidity in the primæ viæ. The acid which is there formed passes off by the kidneys, and causes the precipitation of the uric acid; the use of the alkaline carbonates, by correcting this acidity, prevents this deposition, and of course prevents the increase of the urinary concretion, and lessens the irritating quality of the urine. It has accordingly been found, that under a course of alkaline remedies, the deposition of uric acid, so frequently abundant from the urine of those who labour under calculus, diminishes rapidly. With this intention moderate doses of the alkali in it mildest form, saturated or super-saturated with carbonic acid, are taken as they are required.

These were the views entertained of the operation of lithontriptic medicines, after the discoveries of Scheele and Bergman had made known the properties of uric acid. More recent investigations have extended our knowledge of this subject, and preclude still more the hope of lithontriptics being employed with advantage as actual solvents.

It had always been known, that urinary calculi are not of uniform appearance and qualities. Dr. Wollaston's researches led to the knowledge of some others that are of a very different chemical constitution.

The uric acid calculus, which is the most frequent, is generally of a brown or yellowish colour, of a compact or radiated structure, smooth on the surface, and is perfectly soluble in alkaline solutions.

Another had been observed, composed principally of a matter disposed in layers, white, of a lamellated structure, soft and smooth to the touch, and giving a light powder of a brilliant whiteness. This, the fusible calculus as it has been named, is not soluble in alkaline solutions, but dissolves easily in diluted acids, and it melts before the blowpipe into an enamel. The substance composing it is phosphate of magnesia and ammonia; and though it seldom forms an entire calculus in its pure state, it is often intermixed wtth the other ingredients, or disposed with these in alternate layers.

Phosphate of lime forms another variety of calculus, sometimes alone, but more generally mixed with uric acid, or with phosphate of magnesia and ammonia. Calculi of this kind have usually little induration, feel dry and rough, and are without any lamellated structure; they are not dissolved by the alkalies, but are soluble more or less in diluted acids.

Lastly, a calculus had been known to surgeons, under the name of Mulberry Calculus, derived from its purplish colour, and its rough irregular surface. This is composed principally of oxalate of lime, with portions of uric acid, phosphate of lime, and animal matter. It is harder and heavier than any of the others; and is less affected by the usual solvents, alkaline solutions having no effect upon it, and acids dissolving it with great difficulty; the alkaline carbonates slowly decompose it.

From these diversities in chemical constitution among the urinary concretions, it is obvious that we cannot expect uniform advantage from the use of any active solvent as a lithontriptic, since what dissolves one calculus will have no effect upon another; and cases have accordingly occurred, where, instead of relief being obtained from the alkalis, it has been obtained from weak acids, while in many cases they have been productive of no benefit whatever.

A particular source of difficulty has farther been pointed out by Mr. Brande, attending the attempt to exhibit lithontriptics as solvents. The phosphates of lime and magnesia, which exist in the urine, are retained in solution principally by its excess of acid; if, therefore, with the view of dissolving a uric acid calculus, or preventing its increase, alkalis be given so as to neutralize this acid, the deposition of the phosphates may be favoured, and a layer of them may even form on the existing calculus. And there is reason to believe, that the softness and sponginess which have been observed not unfrequently on the surface of calculi, in patients who have continued for a long period the use of alkalis, and which have been regarded as proofs of partial solution, have arisen from a deposition of this kind. If, on the other hand, from the state of the urine, or from the information afforded by a small calculus being discharged, there were reason to believe that a calculus in the bladder consisted chiefly of phosphate of ammonia and magnesia, if we attempted the solution of this by the administration of weak acids, we run the hazard of causing the deposition of uric acid. It is accordingly found, that these effects take place. In different cases it has been remarked, that when alkalis have been given to correct the deposition of uric acid, or the *red* sediment or gravel from the urine, they have, when continued too long after having produced this effect, caused the deposition of the *white* sediment or gravel,—the phosphate of ammonia and magnesia; and on the other hand, Mr. Brande has

remarked, that when acids were given with the view of removing the deposition of the phosphates, they have, after some time, caused a separation of uric acid. These circumstances render it necessary to employ these remedies with caution, even as palliatives, and seem in a great measure to preclude their use as solvents, since we can scarcely hope, even by an alternation of acids and alkalis, so to adjust them as to obtain to any extent their solvent effects without these counteracting results.

There is another mode, in which it has been supposed that lithontriptics may exert a solvent power. In all urinary calculi, there exists a quantity of animal matter, mucus or albumen, which has been regarded as the cementing ingredient, giving induration to the calculus. On this it has been conceived solvents may act, so as to destroy the cohesion of the aggregate. The experiments of Dr. Egan confirm this, he having found that lime-water is more effectual in destroying the cohesion of a urinary calculus, than an alkaline solution,—a result which, on repeating his experiments, I have likewise obtained. Now, this superiority cannot be ascribed to any action of the lime on the saline ingredients of the calculus, but must arise rather from its chemical action on the albumen or animal mucus, of which it is known to be a solvent; and it may therefore be supposed that lime-water, from this operation, might be used with advantage as a lithontriptic. It would of course require to be given in combination with alkalis, the latter neutralizing the excess of acids in the urine, which would otherwise combine with the lime, and render it inert. But it may be doubted if this could be managed so as to obtain any important effect, or that lime could be secreted in its pure form by the kidneys.

From these observations, the advantages to be expected from lithontriptics, it is obvious, must be very limited. The alkaline remedies probably cannot be given with greater benefit than to correct the excess of acidity in the urine, so frequent in those who labour under calculus, and thus diminish or remove that deposition of gravel as it is named, or small crystalline grains, which often proves a source of irritation. They may even thus perhaps prevent the increase in the size of a concretion. Or it is possible, in cases of the mulberry calculus, which produces much pain from its rough and pointed surface, that pushing the use of them a little farther may sometimes have proved useful, by giving rise to the formation of a layer of the phosphate of ammonia and magnesia, which would render the surface of the calculus soft and smooth. Acids, on the other hand, may be given to correct the deposition of the earthy phosphates. But we can never hope, by the most careful administration of either of them, to dissolve a calculus of any size. To correct the acidity, which is the indication most frequently called for, magnesia is safer than the alkalis, as, from not being secreted by the kidneys, it has no tendency, even when taken in excess, to cause the deposition of the earthy phosphates. In the administration of all of them, it may be of advantage to attend to the state of the urine, so far as regards its chemical constitution, and to suspend or vary the remedies as this may change. And in all cases the continuance of the remedies, and the length to which they are carried, ought to be regulated principally by the relief from pain which the patient receives.

LITHONTRIPTICS.

Potassa.	Calx.
Soda.	Magnesia.
Sapo Albus.	Acida.

Potassa. Potash. (Pages 212, 249, 252.)

This alkali is used as a lithontriptic, either pure or combined with carbonic acid. The pure alkali in the state of solution (Aq. Potassæ) has been given in a dose of 15 or 20 drops, morning and evening, increasing this gradually as far as the stomach can bear it, until the urine is rendered alkaline; and at the same time diminishing the irritation it is liable to produce, by the free use of diluents; and of any mucilaginous or gelatinous liquid. It is under this form that potash has been employed when the actual solution of the calculus has been attempted. Independent, however, of the difficulties which attend this, from the circumstances which have been pointed out under the general observations on the action of lithontriptics, it is scarcely possible to continue the use of the pure alkali to the requisite extent, from the irritation it occasions both in the stomach and bladder; and when it is to be used as a palliative, it is better to employ it under the milder and more grateful form of the super-carbonate.

The super-carbonated potash water, already noticed, (Page 253), affords the most effectual palliative in cases of urinary calculi; the relief obtained from it appears to arise from its neutralizing the free acid in the urine, and thus rendering it less irritating. From half a pound to a pound is given in the course of the day; and it has the important advantage, that, from its mildness, it can be continued for any length of time without reluctance. There is another advantage, perhaps, belonging to the super-carbonated alkalis compared with the pure alkalis. The latter, if pushed too far, are liable to occasion the separation of the earthy phosphates from the urine; and where the urine is in that state in which these predominate, they must prove injurious. But when super-saturated with carbonic acid, the excess of acid will retain the phosphate dissolved, for this effect is obtained even from water impregnated with carbonic acid alone; and thus all the advantage that can be derived from the alkali will be obtained, without the injurious consequences that may arise from the use of it in its pure form.

Soda. Soda. (Page 253.)

Soda, like potash, is used as a lithontriptic, seldom, however, in its pure state. The carbonate, or rather sub-carbonate, is obtained from the barilla of commerce by solution in water and crystallization. The crystals contain half their weight of water of crystallization, and are soluble in two parts of cold, and in an equal part of boiling water. This crystallized salt affords a very excellent form under which the alkali may be administered, so as to give the advantages of a palliative, and which being less expensive than any other, forms a valuable remedy to the poor labouring under calculus. It forms what has been named the Soda Pill. The crystals are exposed to a very gentle heat, until they lose their water of crystallization, and the dry powder is made into pills with soap Of these, half a drachm or a drachm are taken in the course of the day.

Soda is likewise employed under the form of the super-carbonated soda

water, the powers of which are similar to those of the super-carbonated potash water, and which is taken in the same manner.

Sapo Albus. Soap is a form under which the fixed alkalis have been administered in calculous affections. It is a chemical combination of expressed oil with potash or soda. Potash forms only a soft soap, soda gives one that becomes hard; and to form the purer soap which is fit for medicinal use, it is combined with the mildest vegetable expressed oil, as that of the olive. The soap is white, but sometimes is designedly coloured by the addition to it, while soft, of a solution of sulphate of iron.

The acrimony of the alkali is much diminished by its combination with the oil, and on this account soap has been preferred as a lithontriptic, one or two ounces being taken in the course of the day. From the oil it contains, however, it is nauseous, and in such large doses generally offensive to the stomach, and the super-saturation with carbonic acid affords a much better method of rendering the alkali mild. Soap is sometimes used in pharmacy, to give consistence to powders when they are to be formed into pills.

Calx. Lime. (Page 129, 159, 253.)

Lime, in the form of lime-water, has been used in calculus in the quantity of a quart or more daily; it may prove useful by correcting acidity; but in the small quantity in which it can be taken, it can scarcely be supposed that any of it will be secreted by the kidneys, so as to change the composition of the urine. Were it secreted, indeed, it would be rendered insoluble by the free phosphoric and uric acids. The only method in which it could be brought to act on a calculus, would be by conjoining its administration with that of the alkalis, so that the urine should be rendered alkaline. This combination constituted the celebrated remedies of Stephens, the efficacy of which seemed to be established on very strong evidence; but even with every precaution, it may be doubted if the lime could be made to exert any real lithontriptic power.

Magnesia. Magnesia. (Page 191, 254.)

The advantage derived from lithontriptics being in a great measure confined to their neutralizing acidity in the stomach, as above explained, magnesia has been employed for this purpose as equally effectual, and as possessed of some peculiar advantage over the alkalis. From its insolubility it will remain longer in the stomach, and from this it has been supposed, will more certainly neutralize the acid; it has accordingly been affirmed on the authority of Mr. Home, that it diminishes more effectually the deposition of uric acid from the urine; and some cases have been related by Mr. Brande, in which magnesia had proved effectual, where the alkalis previously given had failed to relieve the too abundant secretion of this acid. It has also been supposed, that even if it be taken in excess, it will not, from its insolubility, be secreted by the kidneys, and hence will be less liable than the alkalis, to cause a deposition of the urinary phosphates; and its mildness admits of its continued use. The pure magnesia being more active than the carbonate, and being perfectly mild, it is preferred. The dose in which it has been given, is from a scruple to half a drachm twice a-day. In some cases in which it was employed, in which gout was connected with gravel, the symptoms of the former disease were at the same time alleviated.

Acida. Acids have sometimes been employed as lithontriptics. Where the state of the urinary secretion is such that there is a separation of phosphate of lime or phoshate of ammonia and magnesia, they prevent this by their solvent power; but this is comparatively rare. Where there is a too copious secretion of uric acid, they must increase it, and prove prejudicial; and in such cases accordingly, they almost uniformly occasion irritation and pain. It is singular, however, that they have been found to afford relief, even when they caused a deposition of matter from the urine. If this consisted of phosphate of magnesia and ammonia, it might be supposed that the acid had acted on a calculus composed of this, and by its solvent power had so far weakened its aggregation, as to cause it to fall down. In some cases, however, even where relief was obtained, the sediment has been found to be uric acid: scarcely any other supposition can be made with regard to this, to account for the relief received, than that it had formed part of a concretion, of which the phosphates had been the principal ingredients; and that the latter being dissolved by the acid secreted with the urine, the former had been evacuated in a state of suspension. But this occurrence must be rare; and the use of acids as lithontriptics must be in a great measure limited to those cases in which the earthy phosphates are too abundantly secreted. And in employing them even in these, care must always be taken to guard against the separation of uric acid by their too free or long continued use. The obvious rule is, to give the acid to that extent which shall afford relief from irritation, and which shall lessen or remove the deposition of phosphate of lime, or the more common one of phosphate of magnesia and lime, easily recognized by its white colour from the urine, and to diminish the dose, or rather intermit the use of them, whenever any deposite of uric acid appears.

Different acids have been employed. Much relief has been obtained from some of the vegetable acids, particularly the citric acid, under the form of lemon juice, taken to the extent of half an ounce daily. The muriatic acid has been used with advantage in a dose of from 30 to 50 drops twice or thrice a-day, and the diluted nitric acid of the usual strength, in a dose of 40 drops. According to Mr. Brande's observations, the vegetable acids, particularly the citric and tartaric, are less liable than the mineral acids to produce the separation of uric acid, even when they are taken in large doses for a considerable time. Carbonic acid was at one time employed, but had fallen into disuse, probably from the belief of its action being too weak to produce any lithontriptic effect. It has been found, however, that water impregnated with it, taken as common beverage, diminishes the deposition of earthy phosphates, particularly the phosphate of ammonia and magnesia, rendering the urine transparent, which had before been turbid. Where it does so far succeed, it must be preferable to any of the other acids, both as being less likely to cause any separation of uric acid, and as having the advantage that it can be taken for any length of time without any reluctance, has no injurious effect on the stomach, and admits of being used in that irritable state of the bladder which sometimes precludes the use of the others.

Bitters and astringents, such as Uva Ursi, have been found of service in calculous cases; they evidently are so by restoring the tone of the stomach, and thus preventing the generation of acid; and they cannot therefore be considered strictly as Lithontriptics.

CHAP. XIX.

OF REFRIGERANTS.

The substances arranged by authors on the Materia Medica under the appellation of Refrigerants, have been defined, Such medicines as diminish the force of the circulation, and reduce the heat of the body, without occasioning any diminution of sensibility or nervous energy. The theory delivered of their operation is unsatisfactory and obscure; nor are even the facts adduced to establish that operation altogether precise. It is acknowledged by Cullen, that, "in many trials made on purpose, it did not appear that the supposed refrigerants diminished that temperature of the body, which is the ordinary temperature of it in health." He concludes, therefore, that the definition should apply only to the reduction of the temperature when it has been morbidly increased; and even in this case the effect of these medicines is allowed not to be considerable.

It is not necessary to review the opinions that have been advanced on the mode of operation of refrigerants, they are so extravagant and improbable. The explanation given by Dr. Cullen, it is scarcely possible to understand. Its basis, he remarks, is a doctrine delivered by Needham, "that there is every where in nature an expansive force, and a resisting power; and that, particularly under a certain degree of heat, the expansive power appears in all the parts of organized bodies, in consequence of which they shew a singular vegetating power; while, at the same time, in other bodies there is a power resisting and preventing the action of this vegetating power, and at least of diminishing its force." This power, it is added, is found in those saline substances supposed to be refrigerants; and "as an increase of heat is no other than an increase of the expansive force in the heated parts, it may be understood, how resisting powers may diminish any preternatural expansive force and heat in our bodies."

The discoveries of Modern Chemistry furnish some facts which may perhaps be applied to this subject; and indeed it is only to those discoveries which establish the source of animal temperature, that we are to look for an explanation of the changes to which it is subject.

It is established by experiment, that the consumption of oxygen in the lungs is materially influenced by the nature of the ingesta received into the stomach. When these are composed of substances which contain a small proportion of oxygen, the consumption of oxygen is increased, and this in a short time after the aliment has been received. Thus Mr. Spalding, the celebrated diver, observed, that when he used a diet of animal food, or drunk spiritous liquors, he consumed in a much shorter time the oxygen of the air in his diving-bell; and therefore he had learned from experience to confine himself to a vegetable diet, and water for drink, when following his profession. During digestion, too, it was established by the experiments of Lavoisier and Seguin, that a larger proportion of oxygen than usual is consumed.

The animal temperature is derived from the consumption of oxygen gas by respiration: and an increase in that consumption will occasion a greater evolution of caloric in the system, and consequently an increase of temperature, while a diminution in the consumption of oxygen will have an

opposite effect. If, then, when the temperature of the body is morbidly increased, we introduce into the stomach substances containing a large proportion of oxygen, especially in a loose state of combination, we may succeed in reducing the morbid heat. This we accomplish in part by a vegetable diet, but still more effectually by the use of *acids.* The vegetable acids in particular, which by experience are found to be the best refrigerants, are acted on by the digestive powers, and assimilated with the food. And as the oxygen they contain is in a concrete state, little sensible heat can be produced by the combination of that element with the other principles of the food The nutritious matter conveyed to the blood, containing thus a larger proportion of oxygen than usual, will be disposed to abstract less of it from the air in the lungs, and consequently less caloric will be evolved. The temperature of the body will be reduced, and this operating as a reduction of stimulus, will lessen the number and force of the contractions of the heart.

It might be supposed, that any effect of this kind must be trivial, and it actually is so ; for we find in practice that refrigerants produce no sudden or great change. They operate insensibly, and have little other effect than moderating the morbid heat. The whole of their effects, as Cullen remarks, are so slowly produced, as not to be very evident to our senses, nor easily subjected to experiment, being found only in consequence of frequent repetition.

The other refrigerants, the neutral salts, perhaps act in a similar manner ; the acid they contain may yield oxygen, but they are less effectual than acids, and their refrigerant power is even problematical, except in so far as they operate on a principle different from that which has been pointed out,—the power they have of producing in the stomach a sensation of cold. If a draught of cold water be swallowed, the sensation of cold it produces in the stomach is equivalent to a partial abstraction of stimulus, which being extended by sympathy to the heart, occasions a transient reduction in the force of the circulation, and by this, or by a similar sympathetic affection, causes a sensation of cold over the body. Nitre is an example perhaps of a refrigerant acting in this manner. It excites a sensation of cold in the stomach, even when taken dissolved, and still more in the solid state : and this is followed by reduction in the number and force of the pulsations. Hence nitre acts more suddenly than the other refrigerants, and is more transient in its operation. It may also operate in some degree more permanently, in the same manner as the vegetable acids ; as it is probable, from the florid colour it gives to the blood, that it parts with oxygen readily.

It is evident that the indication to be fulfilled by the use of refrigerants, is the reduction of morbid heat. Hence the propriety of their administration in synocha and other pure inflammatory diseases, and in typhus fever ; in both of which the temperature of the body is increased, though from different causes. In inflammatory diseases, the circulation being so much more rapid than usual, a greater quantity of blood is sent through the whole body and through the lungs in a given time ; and the usual alterations of the blood taking place, the evolution of caloric, which is the consequence of these alterations, must be increased, and the temperature raised. In such cases, the use of acids, by lessening the disposition of the blood to consume oxygen in the lungs, may be useful in reducing the temperature ; and nitre may be of advantage, as it diminishes the force of the contraction of the heart. These means, however, can have only a trivial

effect, compared with those evacuations by which the force of the circulation is lessened.

The increased temperature in typhus fever seems to be owing to the absorption of the animal solids, which, containing comparatively little oxygen, cause the blood to consume more of it in the lungs. The introduction of acids into the system, by affording this element in a concrete state to that matter, will lessen the consumption of it in respiration, and of course moderate the morbidly increased temperature. In either of these forms of disease, therefore, refrigerants may be useful, and accordingly we find them generally used in all the species of febrile affection; though they are still to be regarded as medicines of weak power.

REFRIGERANTS.

Citrus Medica.	Acetum.
Citrus Aurantium.	Super-Tartras Potassæ.
Tamarindus Indica.	Nitras Potassæ.
Oxalis Acetosella.	Sub-Boras Sodæ.

All Acids are supposed to be refrigerants: but the vegetable acids possess this power in a more eminent degree, a superiority which, according to the preceding view, must be founded on their being more easy of assimilation, and of being acted on by the chemical processes of the living system. The native vegetable acids are found chiefly in the fruits of vegetables. The sour juice of these fruits consists of the Citric or Malic Acid, or more frequently of a mixture of both, sometimes with the addition of tartaric acid. The citric acid is that which is most largely employed, as it forms the acid juice of the orange and lemon, the two acid fruits in common medicinal use.

Citrus Medica. Limones. Lemon. (Page 145.) *Succus fructus. Acidum concretum.*

The juice of the fruit of the lemon consists almost entirely of citric acid, diluted with a portion of saccharine and mucilaginous or gelatinous matter. As the fruit cannot always be procured, various methods have been employed to preserve the juice. The most effectual is to add to it, when newly expressed, a portion of alcohol, and to put it aside until the mucilaginous matter is deposited, then by a moderate heat to evaporate the alcohol, and preserve the acid in bottles carefully closed. Even as prepared in this method, however, the juice is liable to chemical change.

By a different process, the citric acid can be procured pure and in a crystallized state. To the expressed lemon juice gently heated, carbonate of lime is added so as to neutralize it; citrate of lime is formed, and being insoluble is precipitated; it is washed with water to carry off the extractive and mucilaginous matter, and is then submitted to the action of sulphuric acid; which, when digested on it for a short time, combines with the lime, and disengages the citric acid; and by evaporation and cooling, this is obtained crystallized. This process was originally given by Scheele, and it has been received into the London Pharmacopœia.

Lemon juice may be regarded as the principal refrigerant: it is preferable to all the other acids, being more mild and grateful, and deriving perhaps some advantage from being more easily assimilated. It is used for the general purposes of refrigerants,—to cool and quench thirst in febrile affections. A grateful beverage is formed from it, diluted largely with ater, and sweetened a little with sugar; or the fruit sliced down is add-

ed to any mild diluent. A preparation from it, which is used as a refrigerant in fever, is what is named the Saline mixture, formed by neutralizing lemon juice by the addition of carbonate of potash, adding to this water, with a little sugar, and a small portion of any distilled water. Of this mixture, a table-spoonful is taken occasionally; it is grateful, but cannot be considered as possessed of much power, any refrigerant quality which may belong to the acid being probably lost by its neutralization.

Another form under which lemon juice is used in fever, principally with the view of relieving nausea or checking vomiting, is that of the Effervescing Draught, as it has been named. A solution of carbonate of potash, and diluted lemon juice, are mingled together, and while in the act of effervescence, the mixture is swallowed. The efficacy of it is probably dependent on the pungency and stimulant operation of the carbonic acid, but it affords a grateful form under which this can be administered.

The juice of the lemon, and indeed the citric acid, as it exists in any vegetable fruit, has been long known as nearly an infallible remedy in scurvy. A theory of its operation in removing this disease has been given, founded on its chemical agency, and particularly on the supposition that it imparts oxygen to the system, which is not without probability. In some forms of urinary calculus it affords relief.

Lemon juice was employed as a remedy in syphilis, at the time nitric acid received a trial, and cases were given in which it proved successful. These are doubtful, and this use of it has never been established in practice.

The crystallized citric acid may be supposed to have the same power as the lemon juice. This, however, is somewhat uncertain, especially with regard to the treatment of scurvy, the disease in which the medicinal efficacy of this acid is most important. It is also deprived of the agreeable flavour of the lemon, and is hence a less grateful refrigerant in fever. The flavour may be communicated to it to a certain extent, by infusing a little of the rind of the lemon in the water in which it is dissolved. It is used medicinally principally in forming the effervescing draught, its solution being added to the solution of carbonate of potash. One ounce of it, dissolved in a pint of water, is said by Dr. Powell to be equal in strength to one pint of common lemon juice.

Citrus Aurantium. The Orange. *Succus Fructus.* (Page 145.)

The juice of the orange has a certain degree of sourness, accompanied, in the variety named the China Orange, when ripe, with a sweetness; in that named the Seville Orange, with a slight bitterness; and this sourness appears to depend on citric acid. The former is used as a refrigerant in febrile affections, more grateful, but less powerful than the fruit of the lemon. It is also used as a remedy in scurvy.

Tamarindus Indica. Tamarind. (Page 190.)

The fruit of the tamarind contains an acid pulp, which is preserved by the addition of unrefined sugar, this forming the Tamarinds of the shops. The acid is principally the citric, sixteen ounces of the prepared pulp containing, according to Vauquelin's analysis, an ounce and a half of citric acid, half an ounce of super-tartrate of potash, two drachms of tartaric acid, and half a drachm of malic acid. This pulp forms a grateful refrigerant beverage, a little of it being infused in tepid water, which is often taken in febrile affections.

Oxalis Acetosella. Wood Sorrel. *Decand. Pentagyn. Gruinal. Folia. Indigenous.*

The leaves of this plant have a sensible sourness, and by expression afford a juice strongly acid. This is owing to the presence of oxalic acid, combined with potash, the acid being in excess. This salt,—the superoxalate of potash, is extracted from it, and purified by crystallization, forms the Salt of Lemons of the shops. The leaves of sorrel have been used from their acidity as a refrigerant, under the form of the whey obtained by boiling them in milk. They have also been employed with advantage, in their recent state, as a stimulating application to scrofulous ulcers.

Acetum. Vinegar. Acidum Aceticum Dilutum.

Vinegar is a weak acid, formed by that species of fermentation which succeeds to the vinous, when the fermented liquor is submitted to the due degree of temperature. The temperature most favourable is between 60° and 70°; the presence of a portion of the yeast formed during the vinous fermentation, promotes the process, and the air must be admitted. The spiritous flavour and pungency, and intoxicating quality of the fermented liquor, are lost, and it becomes sour. While this fermentation, denominated the Acetous, proceeds, the oxygen of the air is absorbed; according to the experiments of Saussure, carbonic acid is formed; and the formation of the acid of the vinegar appears therefore to be owing to the abstraction of carbon, and perhaps some degree of oxygenation of the vinous liquor. The product is in general more acid as the liquor has been more spiritous. Vinegar from wine, therefore, is strongest, and its odour is more grateful. It is obtained of inferior quality both with regard to purity and strength, from fermented malt liquors, or from a solution of sugar, in which fermentation is excited by yeast.

Vinegar fully fermented is limpid, of a yellowish colour, has an odour which is agreeable and somewhat pungent and a sour taste. The acid existing in it, is largely diluted with water, and there are also present portions of gluten, mucilage, and extractive matter, and frequently malic and tartaric acids. The presence of the vegetable gluten renders it liable to that kind of decomposition whence it becomes mouldy on the surface; hence the rationale of the process by which this may be counteracted, and vinegar preserved,—that of boiling it gently for a few minutes,—the gluten being separated by coagulation.

It is freed from its impurities by distillation, the process for which has a place in the Pharmacopœias. Distilled vinegar is colourless, but its odour is less grateful than that of common vinegar. It is however purer, and is not liable to spontaneous decomposition; hence it is preferable for the preparation of medicated vinegars, and other purposes in pharmacy.

The acid which is the basis of vinegar, the Acetic as it is named, canbe obtained in a concentrated state by various methods, principally by the decomposition of its saline combinations; and processes of this kind are now received into the pharmacopœias. As obtained from the metallic acetates by heat, it is extremely strong and pungent; and at one time, the acid thus procured was supposed to differ in composition from that obtained by other methods, and was distinguished by the appellation of Acetic, while the other was named Acetous Acid. It has been established, however, that they differ only in the degree of concentration, and the name Acetic is

applied to the acid in all its states. When concentrated it is highly odorous and pungent, and is used principally as a stimulating perfume.

Common vinegar is sometimes employed as a refrigerant in febrile affections, being added to any common diluent. It is also much celebrated as an antidote to the vegetable narcotics, being swallowed in large draughts. Externally, it is used as an application to burns, and as a discutient. Its odour is grateful when it is sprinkled on the floor of the chamber of the sick in typhoid fevers, though it is not possessed of the virtue which has been ascribed to it, of neutralizing noxious or contagious effluvia. In pharmacy, distilled vinegar is employed as the solvent of the active matter of several vegetable substances.

Offic. Prep.—Acid Acet. Dist. Acid. Acet. Arom. Acid. Acet. Camph. Syr. Acid. Acet. *Ed. Lond. Dub.*

Super-tartras Potassæ. Super-tratrate of Potash. (Page 213.)

From the excess of acid which this salt contains, it possesses the virtues of a refrigerant. A solution of it in a large quantity of water, sweetened with sugar, and receiving flavour from the infusion of the rhind of lemon, forms a cooling beverage, used in febrile affections, and recommended, especially in hospital practice, by its cheapness. Its only disadvantage is its being liable to prove purgative.

Nitras Potassæ. Nitrate of Potash. Nitre. (Page 214.)

This salt impresses a sense of coolness in the mouth, and when taken in small doses frequently repeated, appears to have the effect of reducing the force of the circulation. It is hence sometimes used as a refrigerant in inflammatory diseases, particularly in acute rheumatism, and in hæmoptysis. It is given in a dose of from 5 to 15 grains repeated every four or five hours. When given in large doses, it occasions nausea, and pain of the stomach. It is often used as a refrigerant, under the form of a gargle, in the different species of cynanche, one drachm being dissolved in six or eight ounces of water; or the nitre troches are allowed to dissolve slowly in the mouth.

Offic. Prep.—Troch. Nitr. Pot. *Ed.*

Sub-boras Sodæ. Sub-borate of Soda. Borax.

This salt consists of boracic acid and soda, the soda being slightly in excess; it is brought from Thibet, where it is found in a native state, being dug from a lake in which it is spontaneously deposited. It is impure, but is purified in Europe by crystallization, and is usually in crystalline masses of no regular figure; its taste is cool; it is soluble in eighteen parts of cold, and six of hot water.

Borax is not used internally in modern practice, nor does it appear to possess any activity. Its solution is in common use as a cooling gargle, to relieve the sense of heat in the mouth which attends salivation; and mixed with an equal part of sugar, it is used in the form of powder to remove the aphthous crust from the tongue in children. Mixed with honey, it forms an officinal preparation in the London Pharmacopœia, applied to the same purpose.

Offic. Prep.—Mel. Boracis. *Lond.*

FOURTH DIVISION.—OF MECHANICAL REMEDIES.

The last subdivision of the classification includes these classes of remedies, the operation of which is merely mechanical. Under this I have placed Diluents, Demulcents, Emollients, and Anthelmintics. They are classes of comparatively little importance.

CHAP. XX.

OF DILUENTS.

Diluents have been defined, Substances which increase the fluidity of the blood, by augmenting the proportion of fluid in it. Watery liquors, it is obvious, will have this operation to a certain extent, and strictly speaking, water is the only proper diluent. But different mild sub-tances are added to it to give a slight taste and flavour, so as to render it more pleasant when it is to be drunk in large quantities: and frequently to communicate to it a demulcent quality, diluents and demulcents being generally employed to answer the same indications. With the former intention water is infused on scorched bread; or a decoction of bran is used. Gruel, which is a decoction of the grains of the oat, freed from their husk, is the most common lubricating diluent. Whey (Serum lactis) affords a form still more grateful, which is less liable to pall the appetite or load the stomach than any other, and which, at the same time, conveys some nutrition.

Diluents are prescri ed principally in acute inflammatory diseases, with the view of quenching thirst, diminishing the stimulating quality of the blood, promoting the fluid secretions, and, in particular, rendering the urine more dilute, and therefore less acrid and irritating They are employed too to favour the operation of sweating, being given tepid; and sometimes to promote the action of diuretics, especially of those which are saline. And there are some chronic diseases, more particularly affections of the glandular system, in which diluents appear to be advantageous. Some mineral waters, celebrated for their efficacy, are water uncommonly pure; and the advantage derived from these in scrofula, and some other morbid affections, can scarcely be attributed to any other operation than mere dilution.

CHAP. XXI.

OF DEMULCENTS.

Demulcents are defined, "Medicines used to obviate and prevent the action of acrid and stimulant matters: and that, not by correcting or changing their acrimony, but by involving in it a mild and viscid matter, which prevents it from acting upon the sensible parts of the body," or by covering the surface to which they may be applied. Their action has been supposed to be exemplified in catarrh, where the irritation at the top

of the trachea, occasioning coughing, is removed by mucilaginous substances ; or in gonorrhœa, where the sense of heat and pain from the application of the stimulus of urine to the inflamed surface of the urethra is prevented by similar means.

When these substances are directly applied to the part, it may be understood how this operation is obtained from them. But where they are received by the medium of the stomach into the circulating system, it has been supposed that they can have no such effect. They must be changed by the process of digestion, and lose that viscidity by which only they operate, so that they cannot afterwards be separated by any secretion in their original form. Hence their utility in gonorrhœa and similar affections has been altogether denied.

It is not clear, however, that such a conclusion is just. It is sufficiently certain, that many substances, which undergo the process of digestion, are afterwards separated in their entire state from the blood, by particular secreting organs. There is no gland which has this power more particularly than the kidneys ; substances received into the stomach and digested, afterwards passing off in the urine with all their peculiar properties. Saccharine matter, for example, there is reason to believe, can be separated in this manner ; yet there is no substance which can be supposed to be more completely assimilated by digestion, or to be more easily changed in its composition by the chemical operations of the system. If it therefore can be re-produced by secretion, it is equally probable, that mucilaginous or oily substances, which form the principal demulcents, are capable of such a separation. There can be no doubt, however, but that a great share of the relief demulcents afford in irritation, or inflammation of the urinary passages, is owing to the large quantity of water in which they are diffused, by which the urine is diluted, and rendered less stimulating. Perhaps the relief is to be ascribed solely to this dilution ; since no alteration is perceived in the quality of the urine, from the use of these substances. And, in general, demulcents may be considered as substances less stimulating than the fluids usually applied to the parts that are in a state of irritation.

The diseases in which demulcents are used, are principally catarrh, diarrhœa, dysentery, calculus, and gonorrhœa. They are evidently not medicines of any great power ; they are only calculated to alleviate symptoms, and may be freely used in as large quantities as the stomach will receive them.

Demulcents may be arranged under the two divisions of Mucilages, and Expressed Oils ; to which may be added some substances of a similar nature.

DEMULCENTS.

Acacia Arabica.	Maranta Arundinacea.
Astragalus Tragacantha.	Triticum Hybernum.
Linum Usitatissimum.	Lichen Islandicus.
Althæa Officinalis.	Cornu Cervi.
Malva Sylvestris.	Ichthyocolla.
Glycyrrhiza Glabra.	Amygdalus Communis.
Smilax Sarsaparilla.	Olea Europæa.
Cycas Circinalis.	Sevum Ceti.
Orchis Mascula.	Cera.

ACACIA ARABICA. ARABICUM GUMMI. Gum Arabic. *Polygam. Monoec. Lomentaceæ.* (*Acacia Vera, Ph. Lond.*) *Africa.*

GUM is a proximate vegetable principle, which is obtained by exudation from a number of plants. The Gum Arabic of commerce is not exclusively the produce of one vegetable; that which is most pure, and used to be imported from Egypt, is from a species of mimosa. The London College admit, on the authority of Wildenow, a different genus, Acacia, as substituted for that of Mimosa; they refer, therefore, to the species producing this gum by the name of Acacia Vera, and name the gum itself Gummi Acaciæ, while the Edinburgh College name it Acacia Arabica. The trivial name Gummi Arabicum, is retained, perhaps with propriety, by the Dublin College. The greater part of the gum Arabic of commerce, it appears, is imported from Barbary, being the produce of Morocco, and principally of the mountains of Atlas. It is an exudation in the form of a viscid pellucid juice, from the bark of the trunk and branches of the tree, which hardens by exposure to the air and sun. The purest gum of the shops is in small irregular pieces, white or yellowish, semi-pellucid, without taste or smell: there are other varieties coarser, of a yellow or red colour; these are sometimes named Gum Senegal, and appear to be of different origin. All of them have the properties of Gum; are insoluble in alcohol or oils, and soluble in water, forming a viscid solution named Mucilage.

Gum Arabic is in common use as a demulcent. In catarrh it is allowed to dissolve slowly in the mouth, and its mucilage is the basis of the mixtures usually employed to allay coughing. Sometimes too, it is employed in tenesmus, strangury, and *ardor urinæ*. In Pharmacy, mucilage of gum Arabic is employed for a variety of purposes It serves to suspend heavy powders in waters; to diffuse oils, balsams, and resins in water, and give tenacity to substances made into pills.

Offic. Prep.—Emuls. Acac. Arabic. *Ed. Dub.*—Mucilag. Acac. Arabic *Ed. Lond. Dub.*—Troch. Gum. *Ed.*

ASTRAGALUS TRAGACANTHA. (Astragalus Verus, *Ph. Lond.*) Tragacanth. *Diadelph. Decand. Papilionaceæ. Gummi. South of Europe, Asia.*

TRAGACANTH is a gum obtained by exudation. The plant which was supposed to afford it, was described by Linnæus as a species under the name of Astragalus Tragacantha. According to Oliver, it is of a different species, which he describes under the name of Astragalus Verus; and this is admitted by the London College. Tragacanth is the produce of Persia and of Asia Minor; it is in small wrinkled pieces, semi-transparent and brittle, and has neither taste nor smell. It is regarded as a gum, yet it differs from the other pure gums in not being prefectly soluble in cold water; it is softened and diffused, but remains flocculent and turbid. When heat is applied, it communicates to the water a great degree of viscidity, but still the solution remains turbid: it appears, therefore, to be intermediate between gum and fecula. It is greatly superior to all the gums, in giving viscidity to water: its power in this respect being to that of gum Arabic as 1 to 24.

Tragacanth has virtues similar to gum Arabic. It is less employed, except in some pharmaceutical processes, in which, from its greater viscidity, it is preferred, as in the making of troches.

Offic. Prep.—Mucil. Astrag. Trag. *Ed. Dub.*—Pulv. Trag. C. *Lond.*

Linum Usitatissimum. Flax. *Pentand. Pentagyn. Gruinales. Semen. Indigenous.*

The seeds of this plant yield a strong mucilage by infusion or decoction in water: by expression they afford a quantity of oil. This being inferior in purity to the olive or almond oil, is little used in medicine. But the mucilage having no unpleasant taste or smell, the infusion is frequently used as a demulcent in catarrh and gonorrhœa, being rendered more grateful by the addition of a little sugar and lemon juice. The decoction, containing a portion of the oil diffused in the mucilage, is less grateful.

Offic. Prep.—Infus. Lini Usitatis. *Ed. Lond.*

Althæa Officinalis. Althæa. Marsh-mallow. *Monadelph. Polyand. Columniferæ. Radix. Indigenous.*

This indigenous plant grows, as the name implies, in marshy situations. All the parts of it yield a mucilage by infusion or decoction in water; the root does so most abundantly, and freed from the outer bark, is kept in the shops. It is white, inodorous, and insipid. Its mucilage is similar to that from lintseed, and is used for the same purposes. It is even preferable, as being more pure.

Offic. Prep.—Decoct. Alth. *Ed.*—Syr. Alth. *Ed. Lond.*

Malva Sylvestris. Common Mallow. *Monadelph. Polyand. Columniferæ. Folia. Indigenous.*

The leaves of this plant afford a mucilage by infusion in water, which is weaker, however, than that from lintseed or althæa, and is therefore little used. The leaves have also been used for the purpose of fomentation, and their decoction affords an emollient enema.

Offic. Prep.—Decoct. Malv. Comp. *Lond.*

Glycyrrhiza Glabra. Liquorice. *Diadelph. Decand. Papilionac. Radix. South of Europe.*

The root of this plant, which is long, slender, and flexible, covered with a thin epidermis, has a sweet agreeable taste, with no flavour. This sweetness is extracted by water by infusion or decoction; and by evaporation a dark-coloured extract of the same sweet taste is obtained, consisting principally of saccharine and mucilaginous matter. Alcohol extracts the sweetness of liquorice, with less of the mucilage.

Liquorice-root is employed as a demulcent, and on account of its sweet taste is frequently added to infusions of lintseed or althæa. The extract is in common use as a demulcent in catarrh, being allowed to dissolve slowly in the mouth, to allay the irritation which produces coughing: it also relieves the sensation of heart-burn from acidity in the stomach.

Offic. Prep.—Extr. Glycyrrh. Gl. *Lond. Dub.*—Troch. Glycyrrh. Troch. Glycyrrh. cum opio, *Ed.*

Smilax Sarsaparilla. Sarsaparilla. *Dioecia Hexand. Sarmentaceæ. Radix. South America.*

This root, which is imported from the Spanish West Indies, is in long slender twigs, which for pharmaceutic preparation are split and cut into small pieces. It is internally white, and covered with a brownish bark; has scarcely any smell; its taste is mucilaginous, and slightly bitter. Water extracts its bitterness; by beating it with water, a portion of fecula is

separated, white and insipid, in which the virtues of the root appear to reside.

Sarsaparilla produces no sensible effect on the system, and it can scarcely be regarded in any other light than as a demulcent. It has, however, been considered as a specific in the treatment of some venereal affections, particularly those of the bones or periosteum, and as a restorative in that state of debility which is the consequence of the disease long protracted, or of the mercurial irritation. Without allowing to it any specific power, it appears in such cases to be sometimes productive of benefit, probably from its mild demulcent and nutritious quality, and partly perhaps from the suspension of the use of mercury during its administration. It has also been recommended in extensive ulceration, in cutaneous affections, and in chronic rheumatism. It is always given in the form of decoction, and is frequently joined with guaiac and mezereon, the pungency of which it covers.

Offic. Prep.—Dec. Similac. Sarsap. *Ed. Lond. Dub.*—Dec. Sarsap. Comp. *Lond. Dub.*—Extr. Sarsaparill. *Lond.*

CYCAS CIRCINALIS. Sago. *Cryptogamia. Filices. East Indies.*

SAGO is a fecula obtained from the pith or medullary part of the branches of the plant, by maceration in water. It is dried, and is then in grains of a brownish colour, without taste or smell. Boiled in milk or water, it dissolves entirely; and this with sugar, and the addition frequently of a little wine, forms a nutritious jelly, prescribed in diarrhœa as a demulcent, and in convalescence as a nutritious article of diet, easy of digestion.

ORCHIS MASCULA. Salop. *Gyand. Diand. Orchideæ. Indigenous.*

THE root of this plant, by maceration in water, and beating, affords the fecula known by the name of Salop. Its qualities and virtues are similar to those of Sago.

MARANTA ARUNDINACEA. Indian Arrow. *Monand. Monogyn. Scitamineæ. South America.*

THIS plant is cultivated in several of the West India islands, for the preparation of the fecula which is extracted from its root. The root, freed from its cuticle, is grated down in water, which is poured off repeatedly, allowing the fecula to subside: when it appears to be perfectly purified, the remaining water is strained off on a linen cloth, and the fecula is dried. It forms a powder in fine grains, of a brilliant whiteness. It is used as a demulcent in diarrhœa and dysentery, and as a nutritious article of diet for convalescents. A jelly is prepared by boiling with water or milk, and it is under this form that it is taken.

TRITICUM HYBERNUM. Wheat. *Triand. Digyn. Gramina. Fecula seminum. Amylum.*

STARCH, the fecula of wheat, obtained by beating the grains previously soaked in water, forms a gelatinous solution when boiled in water, which is used as a demulcent. This, Starch Mucilage as it is named, is sometimes given as an enema in tenesmus, and is the common vehicle for giving opium under that form. Starch powder is sometimes used to facilitate friction on the skin, when this is employed as a method of discussing indolent tumors.

Offic. Prep.—Mucilag. Amyli. *Ed. Lond. Dub.*

Lichen Islandicus. Iceland Liverwort. *Cryptogamia Algæ. Iceland.*

The different lichens contain a fecula, which is extracted by boiling in water. The lichen islandicus, so named as being abundant in Iceland, though it is a native also of other countries of the North of Europe, consists principally of this, with a portion of extractive matter, having a degree of bitterness. The bitterness is removed by maceration in cold water, and then by decoction with water a gelatinous solution is obtained. This is used as an article of diet in the countries of which this lichen is a native; and it has been introduced into medical practice as a demulcent, and a nutritious substance easy of digestion: it has from these qualities been used with some advantage in hæmoptysis and phthisis: and from its supposed efficacy, the decoction has received a place in the Pharmacopœias.

Offic. Prep.—Decoct. Lichenis. Island. *Ed. Lond. Dud.*

Cornu Cervi Rasura. Hartshorn Shavings. Cervus Elaphus. Cornu. *Mammalia. Pecora.*

Horn consists chiefly of indurated albumen; the horns of the deer, however, it is singular, are similar to bone in composition, and contain a considerable quantity of gelatin, along with phosphate of lime; they have therefore been received into the Materia Medica. They are freed from their outer rough covering, and the internal white part is rasped down for use. The shavings afford, by decoction in water, a transparent, colourless, and inodorous jelly, which, rendered grateful by sugar and a little wine, is used in diarrhœa and dysentery as a demulcent, and in convalescence as a light nutritious article of diet.

Ichthyocolla. Isinglass. Acipenser Sturio. *Pisces. Chondropterygii.*

Isinglass is obtained from the sound and other parts of the sturgeon, as well as several other kinds of fish caught in the Volga, the Oby, and other rivers, which flow into the Caspian or the Northern Ocean. The sound being well cleansed, is freed from the thin membrane which covers it, is dried by exposure to the air, and is rolled up in a twisted form. It is of a fibrous texture, insipid and inodorous. It is nearly pure gelatin, is therefore almost entirely soluble in water by boiling, and forms a gelatinous solution, which has sometimes been employed as a demulcent; and when rendered grateful by a little sugar and lemon juice, as a nutritive jelly, easy of digestion.

Amygdalus. *Icosandria. Monog. Pomaceæ. Fructus; Nucleus; Ol. Express. Syria, Barbary.*

The kernel of the fruit of the almond is farinaceous, with a portion of expressed oil There are two varieties of it, the one sweet, the other bitter; these are the produce of mere varieties of the same species, their production being dependent, it is said, on culture. The expressed oil afforded by both is the same; the principal part of each, too, appears to be fecula; but with this, in the sweet almond, there is a portion of saccharine matter; the nature of the principle in which the bitterness of the other resides, is not well ascertained: it contains, however, a portion of prussic acid, on which its odour depends, and which appears to communicate to it some degree of narcotic power; none of this seems to be contained in the sweet almond. The oil is obtained by expression from the seeds, or by decoction of them in water. It is very similar to the olive oil, but purer

and more free from any rancidity. In common with expressed oils, it has the properties of a demulcent: and diffused in water by the medium of mucilage, or a few drops of an alkaline solution, it is given in catarrh.

There is another mode in which this oil is given as a demulcent, more grateful,—that of emulsion. The sweet almonds, the external rind being removed by immersion in warm water, are triturated with water; the oil is diffused in the water by the medium of the mucilage and fecula of the almond, and a milky-like liquor is formed, which is used as a pleasant demulcent and diluent, particularly to obviate strangury from the application of a blister.

Offic. Prep.—Emuls. Amygd. *Ed. Lond. Dub.*—Confect. Amygd. *Lond.*

Olea Europæa. Olive Oil. Oleum Olivarum. *Diand. Monogyn. Sepiariæ. Oleum Expressum. South of Europe.*

The oil obtained from the fruit of the olive by expression, is of a light yellowish or greenish colour, without taste or smell, and possessed of the general properties of expressed oil. It is the oil of this class which is most commonly used in medicine. It is employed as a demulcent in catarrh, and some other affections, diffused in water by the medium of mucilage, or by a very small quantity of one of the alkalis, forming what is called the oily mixture, and is thus taken in as large quantities as the stomach can bear; it may be doubted, however, whether with any advantage. It is employed to involve acrid substances which may have been introduced into the stomach. It is also given as an anthelmintic. Externally it is used as an emollient, applied by friction, or forming the basis of liniments and ointments.

Sevum Ceti. Spermaceti. Physeter. Macrocephalus. *Mammalia. Cetaceæ.*

This fatty matter is obtained from the head of the particular species of whale above stated. The cavity of the head contains a large quantity of an oily fluid, from which, on standing, a concrete substance separates. This, freed from the oil by expression, and purified by melting and boiling with a weak alkaline solution, is the common spermaceti. It is in masses of a flaky texture, unctuous and friable; white, with some degree of lustre; and has neither taste nor smell. It is fusible and inflammable, and its chemical properties and relations are similar to those of the expressed oils and fats; it is however less unctuous, does not easily unite with the alkalis, and is soluble to a certain extent in alcohol and ether: it forms a variety of what, from being intermediate in its properties between fat and wax, has been named Adipocire. Its medicinal virtues are those of a mild demulcent, and as such it is given in catarrh and gonorrhœa, mixed with sugar, or sometimes diffused in water by the medium of the yolk of an egg. It enters as an unctuous substance into the composition of ointments.

Offic. Prep.—Cerat. Simplex. Cerat. Cetacei. *Ed. Lond.* Unguent. Cetacei. *Lond. Dub.*

Cera. Wax.—This is a concrete substance of a particular nature, supposed to be collected by the bee from the antheræ of vegetables. The experiments of Huber appear, however, to have proved, that it can be

formed by the bee from changes produced on its saccharine food. Still it is to be regarded as a vegetable product. It forms a covering on the leaves, fruit, and flowers of many plants, and some, as the Myrica Cerifera, afford a substance perfectly analogous in large quantity. Wax, in its chemical properties, resembles most nearly the expressed oils, differing from them principally in solidity, and in combining less readily with the alkalis. When merely melted from the comb, it retains a portion of colouring matter, and forms yellow wax ; it has also an agreeable odour. It may be deprived of both by bleaching,—the wax being melted and cast into thin cakes, which are exposed to the action of light, air, and humidity. It then forms white wax, which is harder and more brittle than the yellow, and rather less fusible.

Wax has been used as a demulcent in dysentery, being diffused in water by means of mucilage of gum Arabic, the wax being first melted with a little oil, to facilitate its trituration ; but it has no particular quality to recommend it. It is used in the composition of ointments and plasters, communicating to them consistence and tenacity.

Offic. Prep.—Emp. Ceræ, *Ed. Lond.*

CHAP XXII.

OF EMOLLIENTS.

The class of Emollients, according to the definition given by Cullen, includes those medicines which diminish the force of cohesion in the particles of the solid matter of the human body, and thereby render them more lax and flexible. Their operation is evidently mechanical ; they are insinuated into the matter of the solid fibre, and either diminish its density, or lessen the friction between its particles. Hence they are useful where the fibres are rigid, or where they are preternaturally extended, and therefore afford relief when topically applied to inflamed parts, to tumors distending the skin, or where the skin is dry and rigid. There may be included under the same class, those substances which, applied to the surface, by their bland quality, afford relief from irritation.

Heat, conjoined with moisture, is the principal emollient. Warm water is of itself useful ; but when applied by the medium of some vegetable substances, as in the different fomentations and cataplasms, it is more advantageous, as the heat is longer retained ; bread in crumbs, or the flour or meal of the common grains, forms the basis of the common cataplasm ; the flowers of the chamomile, or the mallow, are often used as the vehicle for fomentations. The emollient power is little increased by such additions, though some have supposed that the mucilaginous vegetables have some efficacy of this kind.

The other emollients are the oils, or unctuous substances ; they are merely introduced by friction ; and in distension of the animal fibre, as in dropsical swelling, afford some relief. Axungia Porcina, Hog's Lard, is the principal substance of this kind not hitherto noticed. It is the fat of the hog, freed from the cellular fibre. This is done by melting it with

the addition of a little water, to prevent the heat from rising too high. When cold, it becomes concrete; has all the properties of animal fat; and from its softness is adapted to the purposes of an external emollient application. It forms the basis of ointments, which are applied as a dressing to inflamed parts. Such compositions too are formed from the expressed oils, melted with a due proportion of spermaceti or wax; they prove useful in a great measure by excluding the air, while, from their smoothness and softness they excite no irritation. The thick and bland liquid formed by the combination of lime-water with expressed oils, (Linimentum Aquæ Calcis), is another emollient composition, employed as a soothing application to burns, and proving useful by a similar operation. There are some other unctuous substances which have been introduced for similar purposes; such as Palm Oil, an expressed oil nearly concrete, obtained from the kernel of the fruit of the Cocos Butyracea, a native of Brazil. It is obtained by decoction of the kernels bruised in water, the oily matter separating: it is of a lively yellow colour, and rather agreeable odour, and is applied as an emollient by friction. The Oil of the Laurel Berry (Laurus Nobilis) is of similar qualities, and is obtained in the same manner, the berries bruised being boiled in water. It is concrete, of a yellowish-green colour, and has an odour slightly fragrant.

CHAP. XXIII.

OF ANTHELMINTICS.

Anthelmintics are remedies which expel worms from the intestinal canal. They have been supposed to produce this effect by various modes of operation, principally mechanical.

Some which are in rough particles, as iron or tin filings, or consist of sharp spiculæ, as the down of the dolichos pruriens, are supposed, by mechanical action, to dislodge from the mucus of the intestines the worms which are evacuated.

Other substances ranked as anthelmintics seem to have no other property than bitterness. By this quality they have been supposed to prove noxious to these animals; it has also been imagined, that so far as they prove useful, they do so by restoring the tone of the digestive organs; the production of worms being supposed to proceed from debility of these organs, in consequence of which, either the food is not properly assimilated, or the secreted fluids poured into the intestines are not properly prepared.

Lastly, other remedies of this class apparently operate by their cathartic power. Those cathartics which discharge the mucus of the intestines, as gamboge, scammony, or calomel, are supposed more peculiarly to have this effect; and perhaps it is this subdivision of anthelmintics that have most efficacy. Some anthelmintics, it is observed by Dr. Hamilton, "have been considered as a specific poison to the insect, and others are conceived to destroy it by mechanical triture. Most of them have had their partisans for the day, and have passed in succession through the ordeal of experience into oblivion. The utility of such anthelmintics as have been

found to be most beneficial, has, in my opinion, been in proportion to the purgative powers which they possessed."

After a course of those anthelmintics which are not directly cathartic, it is usual to give a full dose of a purgative, which is even repeated two or three times, and to this a considerable share of the effect, when worms are evacuated, is probably to be ascribed. Calomel, with jalap, gamboge, or scammony, is the cathartic usually employed.

ANTHELMINTICS.

Hydrargyrum.	Artemisia Santonica.
Ferrum.	Spigelia Marilandica.
Stannum.	Polypodium Filix Mas.
Oleum Oleæ Europææ.	Tanacetum Vulgare.
Oleum Terebinthinæ.	Geoffræa Inermis.
Dolichos Pruriens.	Cambogia Gutta.

Hydrargyrum. Quicksilver. (Page 109.)

Several mercurial preparations have been employed on account of their anthelmintic power. The black sulphuret, ethiops mineral as it was named, prepared by triturating sulphur and quicksilver in equal parts, has been given in the dose of a few grains to children, and of a scruple or half a drachm to adults. Mercury has been supposed to prove noxious to the class of vermes, and from this any efficacy belonging to this preparation has been inferred to arise. There is another mode in which it may operate. Sulphuretted hydrogen is deleterious to animals of this class, and the natural sulphureous waters impregnated with it, hence sometimes prove powerfully anthelmintic. The sulphuretted mercury may by its chemical action on the fluids of the intestines, cause a production of sulphuretted hydrogen, whence may arise its anthelmintic power. Of the other mercurials, calomel has the advantage, besides any direct anthelmintic power it may exert, of exciting the action of the intestines, and evacuating the intestinal mucus. It is given alone in a dose of one or two grains to children, and from 5 to 10 grains to an adult; or in smaller doses combined with jalap, scammony, or gamboge. It is also generally the basis of the cathartic which is administered after a course of any other anthelmintic remedy.

Ferrum. Iron. (Page 117.)

The filings of this metal has been given as an anthelmintic, in a dose of one or two drachms; and the sub-carbonate, or rust of iron, was highly recommended by Rush as a remedy against the tape-worm, when taken to the extent of three or four drachms.

Stannum. Tin.

Tin is reduced to a powder, consisting of small rounded particles, by heating it nearly to its melting point, and agitating it briskly. Either this powder, or what has been recommended in preference, the metal in filings, is used as an anthelmintic, in a dose of one or two drachms, or even in a much larger quantity, a cathartic being administered after a few doses of it. Its effect has been supposed to be mechanical, dislodging the worm from the mucus of the intestines by the grittiness of its particles. It is not

improbable, too, that it may act by generating hydrogen gas in the intestinal canal, which proves noxious to the animal; and its efficacy has been said to be increased by combination with sulphur, by which sulphuretted hydrogen gas will be evolved. The sulphuretted oxide of tin, *aurum musivum*, was once in use as an anthelmintic, and there is an empirical preparation, Blane's powder, celebrated as an anthelmintic, of which it is said to be the basis.

Oleum Oleæ Europææ. Olive Oil. Oleum Olivarum. *Diand. Monogyn. Sepiariæ. South of Europe.*

Olive Oil, or any expressed oil, taken in the morning to the extent of half a pound, or as much as the stomach can bear, has been said to prove anthelmintic; but in the state of diffusion in which it must act on worms in the intestines, it can scarcely be expected to have any certain power.

Oleum Pini Laricis. Oleum Terebinthinæ. Oil of Turpentine. (Page 220.)

This essential oil has been introduced as an anthelmintic of great power in expelling the tape-worm when given in large doses,—doses indeed so large, compared with those in which it has usually been given, that the practice would appear hazardous, though it is found to be perfectly safe. It was first mentioned by Dr. Fenwick, (Medico-chirurgical Transactions, Vol. II.) Two ounces are given as a dose, and if it do not operate in two hours, an ounce more is given. Purging is generally produced: the worm is evacuated, and is usually lifeless on its expulsion; while, when evacuated by both methods, it generally retains signs of life. The turpentine therefore evidently operates by its deleterious power. Though these large doses have been taken without any injurious consequence, in some cases they have occasioned severe nausea, or tenesmus, and strangury, while similar quantities, as that of a tea-spoonful repeated every three hours for three or four times, have proved successful. In other cases again, these have been unsuccessful, and it has been necessary to employ the larger dose frequently repeated. Its operation on the bowels as a cathartic in the larger quantity, seems to prevent its absorption, and therefore obviates its action on the urinary organs; and it has been stated in conformity to this, that this action giving rise to strangury, is more liable to happen from small than from large doses. Analogy leads to the employment of the same remedy for the expulsion of the other worms which lodge in the intestinal canal, and in one or two cases the lumbrici have been expelled by it. It has also been employed under the form of enema, half an ounce being diffused in starch mucilage, or in water by the medium of the yolk of an egg. The nauseating effect on the stomach is thus avoided, but this mode of application is frequently productive of pain.

Dolichos Pruriens. Cowhage. *Diadelph. Decand. Papilionaceæ. Pubes leguminis rigida. East and West Indies.*

The down which covers the outer surface of the pods of this plant, consists of spiculæ, so sharp, that if incautiously handled, they penetrate the cuticle, and occasion severe itching and inflammation. It is this down which is used as an anthelmintic. It is made into an electuary with syrup or molasses, of which two tea-spoonfuls are given to an adult, and repeated two or three times, a strong cathartic being afterwards exhibited. Its

action is mechanical, the spiculæ producing irritation in the body of the animal, causing its motion, and perhaps also exciting the action of the intestines. In the West India islands it is the common anthelmintic, and is described as being given with much advantage, more so than when used in this country,—a difference which has been explained from the state of the mucous secretion in the intestinal canal, which appears to be more abundant in warm climates; and hence more powerful remedies are required to produce an anthelmintic effect. The electuary ought to be prepared only when it is to be used.

Artemisia Santonica. Wormseed. *Syngen. Polygam. superfl. Compositæ Semen. Persia*

The seeds of this plant have a faint disagreeable smell. and a very bitter taste. They are in common use as an anthelmintic, and probably operate merely as a bitter; the dose is half a drachm, or a drachm of the powder to an adult. This, after being continued for some time, is followed by a dose of a strong cathartic.

Spigelia Marilandica. Indian Pink. *Pentand. Monogyn. Stellatæ. Radix. North America.*

This plant is a native of Virginia and Maryland. The slender stalks of its root have a bitter taste, and are used in medicine, on the supposition of their anthelmintic power; in a large dose they prove purgative, and also sometimes narcotic. They are usually administered in the form of the watery infusion; in the quantity of half a drachm, or even to the extent of two or three drachms to an adult. Its operation as a narcotic has been said to occur from its administration; and to prevent this, it has been recommended to be given rather in large doses, so as to obtain its cathartic operation, by which its narcotic power is obviated. In its dried state, however, in which it is employed in this country, no alarming symptom ever appears to follow from its administration.

Polypodium Filix Mas. Aspidium Filix Mas. Male Fern. *Cryptogamia. Filices. Radix. Indigenous.*

The root of this plant was once highly celebrated as a remedy against the tape-worm; two or three drachms of the powder of it being taken in the morning, and a strong cathartic of jalap or gamboge given soon after it. The efficacy of the prescription probably depended on the cathartic.

Tanacetum Vulgare. Tansy. *Syngen. Polyg. superf. Compositæ. Folia et flores. Indigenous.*

The leaves and flowers of this plant have a strong bitter taste. They have been recommended as anthelmintic, and especially as capable of expelling the lumbrici, and are sometimes used as a popular remedy. The dose, in powder, is from one scruple to one drachm.

Geoffræa Inermis. Cabbage Tree. *Diadelph. Decand. Papilionac. Cortex. Jamaica.*

The bark of this tree is flat and thin. of a brownish colour; it has an unpleasant smell, with a sweetish taste. It is used as an anthelmintic, and has been considered as one of considerable power, especially in expelling the lumbrici. It is usually given under the form of decoction, an ounce being boiled in two pounds of water, to one pound, and from one to two

ounces of this being given as a dose to an adult. It usually operates as a cathartic, and in an over-dose is liable to occasion sickness and vomiting. The same symptoms are said to be induced by the incautious drinking of cold water during its operation. When they occur from either cause, they are relieved by a dose of castor oil. Others, however, have not observed these effects from it, even when it has operated powerfully as an anthelmintic, and have hence concluded, that it acts as a specific poison to worms.

Offic. Prep.—Decoct. Geoffr. Inerm. *Ed.*

Cambogia. Gamboge. (Page 197.)

Gamboge has been celebrated as a remedy against the tape-worm, and by its powerful cathartic operation is sometimes successful in expelling it. It is given in a dose from 5 to 20 grains alone, or combined with two parts of supertartrate of potash. It is frequently also given as a cathartic after other anthelmintics.

[Melia Azedarach. Pride of China. China tree. Poison berry-tree. *Decand. Monogyn. Cortex Radicis.*

This plant is a native of the East Indies, from whence it was introduced into Europe and North America. It is now completely naturalized in this country, and flourishes luxuriantly in the Southern States, especially Georgia and Carolina. The part used in medicine is the bark of the root. It is a powerful anthelmintic, and is much used and highly esteemed by the physicians at the South. It affects the system in a way very similar to the Spigelia Marylandica, producing not unfrequently confusion of the head, stupor, trembling of the hands, &c. This is particularly the case if it be used in the months of March and April, when the sap rises in the tree. Besides this narcotic effect, the melia also proves slightly purgative. The elder Dr. Barton pronounces this article to be one of the best anthelmintics that has yet been discovered. It has been found principally successful against the round worm, though in some cases it has proved effectual also against the Tænia. It is generally given in the form of decoction: to prepare this, three or four ounces of the bark of the fresh root are put into a quart of water and boiled down to a pint; of which ℥ss. to ℥j. may be given every two or three hours till it operates. When administered in this way, it frequently causes both purging and vomiting. B.]

[Punica Granatorum. Pomegranate. *Icosand. Monogyn.*

The pomegranate is a native of Asia, Barbary, and the South of Europe. From thence it was introduced into the West Indies, where it produces a larger and better flavoured fruit than it does in its native climate. The part used in medicine is the bark of the root. Although mentioned by Celsus as a remedy against worms, the pomegranate has been but little used for that purpose until very recently. In the East Indies, it has long been a popular remedy against the Tænia, and the recent experience of the European surgeons in that quarter of the globe has fully confirmed its powers. It may be given in the form of powder in doses of from ℈j. to ʒss. every three or four hours—or in decoction, made by boiling ℥ij. of the powdered bark in a pint and a half of water, down to about a pint. Of this when cold a wine glass full is to be given every half hour until four doses have been taken. Generally speaking, the worm is passed alive a few minutes after the last dose is taken. B.]

APPENDIX

TO PARTS I. & II.

In concluding the history of the articles of the Materia Medica, I have thought it proper to present a view of that arrangement in which they are associated according to their natural characters, this being the arrangement I follow in my course of Lectures, and a view of it therefore will facilitate a reference to the present work. In classing them on this principle, they have usually been comprised under the three divisions of Mineral, Vegetable, and Animal substances. The first of these, however, is either not sufficiently comprehensive, or too great an extension must be given to the signification of the term applied to it, so as to include substances which cannot be referred to either of the others, and which, at the same time, cannot be regarded as belonging to what is strictly denominated the Mineral Kingdom.

A more correct division is, into the two Classes of Unorganized Substances, and of Substances which are the Products of Organization, the latter comprising the vegetable and animal products, while the former may comprehend all the other articles of the Materia Medica. The substances belonging to the first may be subdivided according to their chemical relations; those to the second according to their natural affinities. Thus, under the one will be placed the orders of Salts, Earths, Inflammables, Metals, Waters, and Airs. Under the other, both Vegetable and Animal Substances may be arranged according to the usual classes of the Linnæan System. With regard to vegetables, some have preferred associating them as they belong to the natural families or orders of plants; for as in these the arrangement is founded not on arbitrary characters, but on similarity of structure and organization, those substances, it has been imagined, will be brought together, which are possessed of similar powers. But this system of natural classification is still so defective, that this has been hitherto very imperfectly attained; there is therefore no advantage in departing from the usual arrangement.

There are some substances, such as the vegetable acids, which may be placed under either general division. They are strictly products of operations depending on organization; they can also, however, be formed by artificial processes; and from their chemical constitution, I have judged it preferable to associate them with the substances to which they appear to have the most strict relation.

From the progress of botanical knowledge, changes are necessarily made with regard to the specific or generic distinctions of the plants employed in medicine. Wherever these appear to be established I have admitted them into the following tables; but where they have been only lately introduced, and remain doubtful, I have thought it preferable to retain the old name and arrangement, indicating in a note the change that has been proposed, and the Pharmacopœia in which it is adopted. Under the history of the substance referred to in the body of the work, will be found the authority on which the proposed alteration rests.

TABULA MATERIÆ MEDICÆ.

I. INORGANICA.

CLASSIS I.—SALES.

ORDO—ACIDA.

Acidum sulphuricum
——— nitrosum
——— nitricum
——— muriaticum
——— oxy-muriaticum
——— phosphoricum
——— carbonicum
——— aceticum
——— tartaricum
——— citricum
——— benzoicum

ORD.—ALKALIA.

Potassa
Soda
Ammonia

ORD.—SALES NEUTRI.

Sulphas potassæ
Sulphas sodæ
Nitras potassæ
Murias sodæ
Murias ammoniæ
Oxy-murias potassæ
Phosphas sodæ
Carbonas potassæ
Sub-carbonas potassæ
Carbonas sodæ
Sub-carbonas sodæ
Bi-carbonas sodæ
Carbonas ammoniæ
Sub-carbonas ammoniæ
Sub-boras sodæ
Acetas potassæ
Acetas ammoniæ
Super-tartras potassæ
Tartras potassæ
Tartras potassæ et sodæ
Citras potassæ
Citras ammoniæ

Cl. II.—TERRÆ.

Calx
Carbonas calcis
Murias calcis
Phosphas calcis

Baryta
Murias barytæ

Magnesia
Carbonas magnesiæ
Sulphas magnesiæ
Murias magnesiæ

Alumen
Super-sulphas aluminæ et potassæ

Cl. III.—INFLAMMABILIA.

Sulphur
Sulphuretum potassæ
Hydro-sulphuretum ammoniæ

Phosphorus

Carbo
Petroleum
Alcohol
Ether sulphuricus
Ether nitricus

Cl. IV.—METALLA.

Argentum
Nitras argenti

Hydrargyrum
Oxidum hydrargyri per triturationem
Oxidum hydrargyri cinereum
Oxidum hydrargyri rubrum
Sub-sulphas hydrargyri flavus
Nitras hydrargyri
Sub-nitras hydrargyri ruber
Murias hydrargyri corrosivus
Murias hydrargyri mitis
Murias hydrargyri et ammoniæ
Acetas hydrargyri
Sulphuretum hydrargyri nigrum
Sulphuretum hydrargyri rubrum

Ferrum
Oxidum ferri nigrum
Oxidum ferri rubrum
Sulphas ferri
Murias ferri
Murias ferri et ammoniæ
Carbonas ferri
Acetas ferri
Tartras ferri et potassæ
Carbonas ferri et potassæ

Cuprum
Sulphas cupri
Sub-acetas cupri
Ammoniuretum cupri

Plumbum
Oxidum plumbi semi-vitreum
Sub-acetas plumbi
Acetas plumbi
Super-acetas plumbi

Stannum

Zincum
Oxidum zinci
Carbonas zinci
Sulphas zinci
Acetas zinci

Bismuthum

Antimonium
Sulphuretum antimonii
Oxidum antimonii
Oxidum antimonii cum phosphate calcis
Tartras antimonii et potassæ

Arsenicum
Oxidum arsenicum album
Arsenias potassæ

Cl. V.—AQUA.

Aqua pura

Aquæ minerales
——— carbonatæ
——— salinæ
——— sulphureæ
——— ferrugineæ

Aqua marina

Cl. VI.—GASEA.

Gas oxygenium
Gas oxidum nitrosum
Gas nitrogenium
Gas hydrogenium
Gas acidum carbonicum
Gas hydrogenium carburetum

ELECTRICITAS.

GALVANISMUS.

II. ORGANICA.

VEGETABILIA.

CLASSIS—MONANDRIA.

ORD.—MONOGYNIA.

Amomum repens *
Amomum zingiber †
Amomum zedoaria
Maranta arundinacea

Cl.—DIANDRIA.

ORD.—MONOGYNIA.

Olea Europæa
Rosmarinus officinalis
Salvia officinalis
Gratiola officinalis

ORD.—TRIGYNIA

Piper nigrum
——— longum
——— caudatum

Cl.—TRIANDRIA.

ORD.—MONOGYNIA.

Valeriana officinalis
Crocus sativus
Iris florentina

ORD.—DIGYNIA.

Saccharum officinarum
Triticum hybernum

Cl.—TETRANDRIA.

ORD.—MONOGYNIA.

Rubia Tinctorum
Santalum album
Dorstenia contrayerva

Cl.—PENTANDRIA.

ORD.—MONOGYNIA.

Hyoscyamus niger
Atropa belladona
Nicotiana tabacum
Datura stramonium
Solanum dulcamara
Strychnos nux vomica
Capsicum annuum
Cinchona cordifolia
——— lancifolia
——— oblongifolia
Anchusa tinctoria
Spigelia marilandica
Callicocca ipecacuanha
Convolvulus jalapa
Convolvulus scammonium
Rhamnus catharticus

ORD.—DIGYNIA.

Gentiana lutea
Conium maculatum

* Elettaria cardamomum, Ph. Lond.

† Zingiber Officinalis, Ph. Lond.

Ferula assafœtida
Bubon galbanum
Carum carui
Coriandum sativum
Pimpinella anisum
Anethum fœniculum
Angelica archangelica

ORD.—TRIGYNIA.

Rhus toxicodendron

ORD.—PENTAGYNIA.

Linum usitatissimum

Cl.—HEXANDRIA.

ORD.—MONOGYNIA.

Calamus acorus
Allium sativum
Scilla maritima
Aloe spicata

ORD.—TRIGYNIA.

Colchicum autumnale

Cl.—HEPTANDRIA.

ORD.—MONOGYNIA.

Æsculus hippocastanum

Cl.—OCTANDRIA.

ORD.—MONOGYNIA.

Amyris opobalsamum
Daphne mezereum

ORD.—TRIGYNIA.

Polygonum bistorta

Cl.—ENNEANDRIA.

ORD.—MONOGYNIA.

Laurus cinnamomum
Laurus cassia
Laurus camphora
Laurus sassafras

ORD.—TRIGYNIA.

Rheum palmatum

Cl.—DECANDRIA.

ORD.—MONOGYNIA.

Cassia senna
Cassia fistula
Ruta graveolens
Guaiacum officinale
Toluifera balsamum
Myroxylon peruiferum
Styrax officinale
Styrax benzoinum
Copaifera officinalis
Hæmatoxylon campechianum
Swietenia febrifuga
Swietenia mahagoni
Quassia amara
Quassia simarouba
Arbutus uva ursi
Rhododendron chrysanthum

Cl.—DODECANDRIA.

ORD.—MONOGYNIA.

Asarum Europæum
Canella alba

ORD.—TRIGYNIA.

Euphorbia officinalis

Cl.—ICOSANDRIA.

ORD.—MONOGYNIA.

Myrtus pimenta
Prunus lauro-cerasus
Amygdalus communis
Eugenia caryophyllata

ORD.—POLYGYNIA.

Rosa centifolia
Rosa rubra
Tormentilla erecta*

Cl.—POLYANDRIA.

ORD.—MONOGYNIA.

Papaver somniferum

ORD.—TRIGYNIA.

Aconitum napellus

ORD.—POLYGYNIA.

Helleborus niger

Cl.—DIDYNAMIA.

ORD.—GYMNOSPERMIA.

Hyssopus officinalis
Mentha piperita
Mentha viridis
Mentha pulegium
Lavandula spica

ORD.—ANGIOSPERMIA.

Digitalis purpurea

Cl.—TETRADYNAMIA.

ORD.—SILICULOSÆ.

Cochlearia armoracia

ORD.—SILIQUOSÆ.

Sinapis alba

Cl.—MONADELPHIA.

ORD.—TRIANDRIA.

Tamarindus Indica

ORD.—POLYANDRIA.

Althæa officinalis
Malva sylvestris

Cl.—DIADELPHIA.

ORD.—OCTANDRIA.

Polygala senega

ORD.—DECANDRIA.

Pterocarpus santolinus
Pterocarpus draco
Dolichos pruriens
Geoffrœa inermis
Glycyrrhiza glabra
Astragalus tragacantha †

Cl.—POLYADELPHIA.

ORD.—ICOSANDRIA.

Citrus aurantium
Citrus medica

ORD.—POLYANDRIA.

Melaleuca leucadendron ‡

Cl.—SYNGENESIA.

ORD.—POLYGAMIA ÆQUALIS.

Lactuca virosa
Lactuca sativa

ORD.—POLYGAMIA SUPERFLUA.

Artemisia santonica
Artemisia absinthium
Anthemis nobilis
Anthemis pyrethrum
Arnica montana

Cl.—GYNANDRIA.

ORD.—DIANDRIA.

Orchis mascula

ORD.—HEXANDRIA.

Aristolochia serpentaria

ORD.—POLYANDRIA.

Arum maculatum

Cl.—MONOECIA.

ORD.—POLYANDRIA.

Quercus pedunculata
Quercus cerris

ORD.—MONADELPHIA.

Pinus balsamea
Pinus larix
Pinus sylvestris
Pinus abies
Pinus picea
Croton elutheria
Ricinus communis

ORD.—SYNGENESIA.

Momordica elaterium
Cucumis colocynthis
Bryonia alba

Cl.—DIOECIA.

ORD.—PENTANDRIA.

Pistacia lentiscus
Humulus lupulus

ORD.—HEXANDRIA.

Smilax sarsaparilla

ORD.—MONADELPHIA.

Juniperus communis
Juniperus sabina
Myristica moschata

Cl.—POLYGAMIA.

ORD.—MONOECIA.

Veratrum album
Stalagmitis cambogioides
Acacia
——— catechu

ORD.—DIOECIA.

Fraxinus ornus

Cl.—CRYPTOGAMIA.

ORD.—FILICES.

Polypodium filix mas §
Cycas circinalis

ORD.—ALGÆ.

Lichen islandicus

Ammoniacum ||
Sagapenum
Myrrha
Kino ¶
Bonplandiæ trifoliatæ cortex **
Colombo

ANIMALIA.

CLASSIS.—MAMMALIA.

Moschus
Catoreum
Cornu cervi
Sevum ceti
Axungia porcina

Cl.—PISCES.

Ichthyocolla

Cl.—INSECTA.

Cantharis vesicatoria ††
Cera
Coccinella
Lapilli et chelæ cancrorum

Cl.—VERMES.

Os sæpiæ
Corallium
Spongia

* Tormentilla officinalis.
† Astragalus verus, Ph. Lond.
‡ Melaleuca cajuputi, Ph. Lond.
§ Aspidium filix mas, Ph. Lond.
|| Heracleum gummiferum, Ph. Lond.
** Cusparia febrifuga, Ph. Lond.
¶ Eucalyptus resinifera, Ph. Ed. Butea frondosa, Ph. Dub.
†† Lytta vesicatoria, Lond.

MATERIA MEDICA

AND

PHARMACY.

VOL. II.—PART III.

The objects of Pharmacy are, the Preservation, Preparation, and Composition of Medicines. These, in the state in which they are afforded by nature, are not always best adapted to the treatment of disease: they are in many cases liable to change from spontaneous decompositions, which require therefore to be counteracted: their powers sometimes reside, not in the entire matter of which they consist, but in principles capable of being extracted, and which are employed with advantage in an insulated state or under peculiar forms; by chemical combinations, remedies altogether new are obtained; and, lastly, medicines frequently require to be combined to fulfil particular indications, or they are rendered less ungrateful, more safe, and even more active, when given in a state of mixture. Pharmacy, regarded as an art, prescribes the rules by which the operations for the attainment of these objects are conducted, and as a science, unfolds the principles on which they depend.

The Preservation of medicines is, generally speaking, the least important part of Pharmacy. Those which are most liable to decomposition are the vegetable products, many of which, especially when the re-action of their elements is favoured by humidity, suffer such changes as weaken their medicinal properties. Changes, productive of the same result, are not unfrequently occasioned by the action of air and light. The methods by which these are counteracted, of which the most important is Exsiccation, belong to this division of Pharmacy. It includes, too, the few general rules which are observed in collecting plants in that state of vigour and maturity in which they are possessed of the greatest degree of activity. And there belong to it also those operations which are necessary to preserve unaltered the few animal products employed in medicine.

Under the second branch of Pharmacy, the Preparation of Medicines, are included a number of important operations, agreeing in general, in affording substances different, more or less, in chemical constitution, from the substances operated.

The medicinal powers of vegetable substances, it has already been re-

marked, frequently reside in peculiar proximate principles, which, from their relations to certain solvents, can be separated from each other; and thus, in many cases, the principle on which the medicinal activity of the substance depends, can be obtained in a pure, and, if necessary, in a concentrated state. Resins, for example, are dissolved by alcohol, gums by water, extractive matter by either of these liquids, or by a mixture of both, and by this separation important advantages may be obtained; the medicine is rendered more certain in its operation; it is more easily preserved, or more conveniently administered. On this are founded the various pharmaceutic preparations of infusions, decoctions, tinctures, medicated wines or vinegars, and extracts;—forms under which medicines are often employed in preference to their natural state.

The proximate principles of plants are sometimes obtained apart by other processes, as by distillation, or even by mechanical expression, whence other forms of preparations are obtained.

To this division belong too the Saline and Metallic Preparations. These are entirely the results of chemical processes; they are new remedies formed by chemical combination, and are possessed of properties altogether different from those of the substances from which they are prepared.

In all these preparations, chemical changes are produced to a greater or less extent. Medicines are also, however, frequently given in a state of mixture, in which they either exert no mutual chemical action, or none producing any modification of their powers. This forms what is named Composition in Pharmacy. It is employed with different views; sometimes, for example, to conceal a medicine, to render it less unpleasant, or to give it a convenient form. And frequently more important advantages are attained; the action of one medicine on the system, or on a particular organ, so far co-operating with that of another, as to render its operation more certain, or more powerful, or even sometimes giving rise to such a modification, as to produce an effect different from that which would be obtained from the action of either.

Pharmacy, as practised in this country, is regulated by the Pharmacopœias of the respective Colleges. As many of the processes inserted in these are necessarily alike, I had formerly given an entire translation of the Edinburgh Pharmacopœia only, and introduced merely those preparations in the London and Dublin Pharmacopœias which are peculiar or important. But in the last edition of this work, I considered it preferable to give a translation of the processes of all the Pharmacopœias, as more satisfactory, and conveying a more full and distinct view of Pharmacy, and this plan I have adhered to in the present edition. The order of the chapters, and their titles, are those of the Edinburgh Pharmacopœia; and under each I have inserted the corresponding preparations of the other Pharmacopœias.

CHAP. I.

VEGETABILIUM EXSICCATIO.—DRYING OF VEGETABLES.

Vegetabilium Exsiccatio. The Drying of Vegetable Substances. Edin.

"Herbs and Flowers are to be dried with the gentle heat of a stove, or a common fire, in such a quantity that the drying may be performed as quickly as possible. Their virtues are thus best preserved, the mark of which is their retaining completely their native colour.

"The leaves of hemlock, and others containing a subtile volatile matter, are, immediately after drying, to be rubbed to powder, and kept in glass vessels well stopt."

The root of the sea squill, after having removed its external coat, is to be first cut transversely into thin slices. The mark of its being properly dried is, that it should retain its bitterness and acrimony, though rendered friable.

Herbarum Exsiccatio. Drying of Herbs. Dub.

"Let the recent leaves of the herb gathered when in flower be put into paper bags, and exposed to a low degree of heat for an hour; then spread them lightly on a sieve, and dry them as quickly as possible, taking care that their green colour is not injured by too high a heat; if they are to be used under the form of powder, let them be reduced to powder immediately, and let this be kept in opaque phials well closed.

"Herbs and flowers from which oils and distilled waters are to be procured, ought to be dried as soon as they are gathered."

Vegetabilia. Vegetables. Lond.

Vegetables are to be gathered in their native soil and situation, in dry weather, when they are neither wet with rain nor with dew; this is to be done every year, and those older are to be thrown away.

Most roots are to be dug up before their leaves or stalks shoot.

Barks should be gathered when they are most easily separated from the wood.

Leaves should be taken after the flowers have faded, and before the seeds ripen.

Flowers are to be gathered when newly opened.

Seeds should be collected when ripe, and before they fall, and are to be kept in the seed vessels.

By drying herbs and flowers, or expelling a great part of the water they contain, those spontaneous chemical changes which are favoured by humidity are prevented, and they are rendered capable of being preserved. The more quickly they are dried, they retain in general their virtues more completely, care only being taken that too much heat be not applied, as from this part of their volatile principles would be dissipated, and their flavour and medicinal qualities impaired. Even when dried, they suffer some changes in keeping, probably from the action of the air and light; and some do so more rapidly than others. Hemlock, in particular, has its colour and odour impaired in a very short time; it is therefore necessary to exclude it from the air, and likewise from exposure to light.

Pulvis Scillæ. Powder of Squill. Dub.

"Let the roots of squill, freed from their membranous integuments, and cut into transverse slices, be dried on a sieve with a gentle heat: then reduce them to powder, which must be kept in glass phials well stopt."

The layers of squill root being covered by a thin membrane, can be dried properly only by being cut into transverse slices. By the drying, the squill loses about four-fifths of its weight, and with little diminution of its powers, if too much heat has not been applied. It is in this state that it is commonly employed in medicine, and for other pharmaceutic preparations. It requires to be kept in a dry place, as otherwise it regains its softness, and is liable to become mouldy. Though the Dublin College order it to be reduced to powder, it is better to preserve the dried root without pounding it. It should be prepared, too, only in a small quantity at a time; and in general the recent squill will be found more certain and uniform in strength.

Præparata ex Animalibus. Preparations from Animals. Lond.

Adeps Præparata. Prepared Lard. Lond.

"Cut the fat into small pieces; then press it, liquified by a gentle heat, through linen."

Adeps Suillus Præparatus. Prepared Hogs Lard. Dub.

"Let fresh lard, cut into small pieces, be melted by a gentle heat, and strained by pressing it through a cloth.

"Lard, which is prepared by those who sell it, and which is preserved with salt, is to be melted with twice its weight of boiling water, the mixture being well stirred. It is then to be set aside to cool, and the lard is to be separated."

Sevum Præparatum. Prepared Suet. Lond.

"Cut suet into pieces; then press it, melted by a gentle heat through linen."

The design of these processes is to free the fat from the membranous fibres intermixed with it; but as it is generally prepared before it is brought to the shops, the Edinburgh College have omitted the directions they formerly gave. If the heat be raised too high, the fat acquires a brown colour and empyreumatic smell; it is therefore usually melted with a little water, by which this is prevented.

Cera Flava Purificata. Purified Yellow Wax. Dub.

"Take of yellow wax any quantity, melt it with a moderate heat; take off the scum, and after allowing it to settle, pour it off from the impurities."

Cornu Ustum. Burnt Horn. Lond.

"Burn pieces of Horn in an open fire, until they become perfectly white; then rub them to powder, and prepare them in the same manner that chalk is prepared."

Pulvis Cornu Cervini Usti. Powder of Burnt Hartshorn. Dub.

"Burn pieces of Hartshorn, until they become perfectly white, then reduce them to a very fine powder."

Horn consists chiefly of indurated albumen, with a portion of gelatin; the quantity of phosphate of lime it contains is usually small, and in this

respect it differs essentially from bone. It is singular, however, that the horns of the deer approach closely to bone in composition, and afford a large quantity of phosphate of lime when calcined. The Dublin College, therefore, properly named Hartshorn as the kind of horn to be burnt. During the burning, the gelatin of the horn is decomposed; its carbonaceous matter partly remains, giving a black colour; but by continuing the heat, this also is burnt out. The phosphate of lime, which is the product of the process, is a substance apparently inert, though from a theoretical view as to the cause of rickets and mollities ossium, it has been proposed to be given as a remedy in these diseases. It is used to reduce substances which are soft and tenacious, as opium, to powder. being rubbed along with them; and is better adapted to this purpose than chalk, which is sometimes employed, as it is more gritty. Its powder is sometimes employed as a dentifrice.

Spongia Usta. Burnt Sponge. Lond.

"Cut sponge into pieces; and bruise it, so that it may be freed from adhering extraneous bodies; then burn it in a close iron vessel, until it become black and friable: lastly, rub it into a very fine powder.

Pulvis Spongiæ Ustæ. Powder of Burnt Sponge. Dub.

"Bruise sponge cut in small pieces, so as to free it from small stones; then burn it in a close iron vessel, until it become black and friable; and, lastly, reduce it to power."

Burnt sponge has been celebrated as a remedy in bronchocele, and in scrofulous affections of the glands, given in a dose from 20 to 30 grains. It contains carbonate and muriate of soda, carbonaceous matter, and a small quantity of iodine, to the latter of which, its virtues as a remedy in bronchocele appear to be owing.

Dr. Coindet of Geneva has employed iodine very extensively as a remedy in goitre, to the exhibition of which it appears he was led by the circumstance of burnt sponge, which contains iodine, forming the basis of all those remedies which have been used with any success in that disease. The form under which he preferred to employ it, was that of the ioduretted hydriodate of potass: this is prepared by dissolving 36 grains of the hydriodate, and 10 of iodine, in an ounce of distilled water: the hydriodate is obtained by saturating potass with hydriodic acid, the acid itself being procured by transmitting sulphuretted hydrogen through a solution of alcohol containing iodine. The dose of this medicine is from five to ten drops, thrice a-day, in syrup: this may be gradually increased to twenty, but with great caution, for when given to excess, it acts very violently upon the system. Under this treatment, continued for a few weeks, it is stated that the goitre will disappear. If, during its exhibition, the pulse should become more quick, and the patient should lose flesh rapidly, accompanied by palpitation, a dry cough, and want of sleep, with increased appetite in some, the diminution of the goitre will be observed, and it will become necessary to intermit the medicine for some days, resuming it afterwards, when the state of the patient's health will permit it.

Pulvis Quercus Marinæ. Powder of Sea Oak, or Sea Wrack. Dub.

"Take of sea wrack with its vesicles any quantity. Dry and free it from its impurities; then expose it in an iron pot or crucible, to which a perforated cover is adapted, to the fire, until the vapours which arise

having ceased, the mass becomes of a dull red. Reduce the carbonaceous matter which remains to powder."

This substance is analogous to the preceding preparation, and is supposed to have similar medicinal powers.

CHAP. II.

PULPARUM EXTRACTIO—EXTRACTION OF PULPS.

PULPARUM EXTRACTIO. Extraction of pulps. Ed.

"Those fruits which afford a pulp, if they are unripe, or if ripe and dry, boil with a little water, that they may become soft. Then express the pulp though a hair-sieve, and boil it with a gentle heat in an earthen vessel, stirring it frequently that it may not burn, until it attain the consistence of honey.

"The pulp of cassia fistula is to be boiled from the bruised pod; and then, by evaporating the water, to be reduced to the due consistence. The pulps of ripe and fresh fruits are to be pressed through a sieve, without previous boiling."

PULPARUM EXTRACTIO. Extraction of Pulps. Dub.

"Fruits, the pulps of which are to be extracted, if they are unripe, or if ripe and dry, are to be boiled with a small quantity of water until they become soft. The pulps being pressed through a hair-sieve are to be evaporated to a proper consistence, by a slow evaporation."

VEGETABILIUM PRÆPARATIO. Preparation of Vegetables. Lond.

"VEGETABLES, soon after they are collected, those excepted which are to be used in the recent state, are to be spread out lightly, so as to dry as quick as possible, with a heat so gentle, that their colour may not change; they are then to be kept in proper vessels, or situations where the access of light and humidity may be excluded.

"ROOTS, which are ordered to be kept fresh, ought to be buried in dry sand. The root of squill, before drying it, is to be cut transversely into thin slices, the outer dry layers being removed.

"PULPY FRUITS, if they are not ripe, or if ripe and dry, are to be exposed in a damp place until they become soft, then press out the pulp through a hair-sieve, afterwards boil with a gentle heat, stirring frequently; lastly, dissipate the water by the heat of a water-bath, until it has become of the proper consistence.

"On the pods of cassia bruised, pour boiling water, so as to wash out the pulp, which press first through a sieve with large holes, afterwards through a hair-sieve, then evaporate the water by the heat of a water-bath, until the pulp attain the proper consistence.

"Press the pulp or juice of ripe and fresh fruits through a sieve, without any previous boiling."

These directions are given principally for the preparation of the pulps of several fruits which enter into the composition of the Electuary of Senna. Pulps are seldom otherwise medicinally employed, and they cannot be long preserved unchanged.

CHAP. III.

CONSERVÆ.—CONSERVES.

Conserves are compositions of fresh vegetable matter with sugar. The form is designed to preserve such vegetables as lose their virtues by drying; sugar in some measure counteracting the spontaneous decomposition to which vegetable matter is liable in a humid state. For this purpose, about three times the weight of the vegetable of refined sugar is employed. Its operation, however, is but imperfect: the powers of any active vegetable can scarcely be preserved unimpaired for any length of time in this form; and, therefore, there is no conserve ordered in the Pharmacopœias of any powerful medicine, those which are inserted being merely recommended by their agreeable flavour, and being not used but as vehicles for the exhibition of more active remedies, under the form of bolus, pill, or electuary.

The Edinburgh College admits three conserves.

Conserva Citri Aurantii, ex cortice recentis fructus, radula abraso; Conserve of the outer rhind of the Orange rasped by a grater;

Conserva Rosæ Caninæ, ex fructu maturo, a seminibus eorumque pube solicite purgato: Conserve of the fruit of the Dog-hip, carefully freed from the seeds and included down;

Conserva Rosæ Gallicæ, ex petalis nondum explicitis: Conserve of the Unblown Petals of the Red Rose;

With regard to all which, they give, as the directions for their preparation, that the vegetable matter is to be beat into a pulp, to which is to be added gradually, during the beating, three times its weight of refined sugar in powder.

The London College have united the Conserves with the preparations named Electuaries, and have given them the common name of Confection,—improperly, as conserves are compositions of fresh vegetables with sugar added to prevent decomposition, while electuaries are composed usually of dry powders with syrup added to give merely a convenient form. Of those which correspond with what have usually been denominated Conserves, they have retained the three which have a place in the Edinburgh Pharmacopœia; and have given the following directions for the preparation of each. The Dublin College admit only the Conserve of the Rhind of the Orange, and the Conserve of the Petals of the Red Rose.

Confectio Aurantiorum. Confection of Orange Peel. Lond.

"Take of the exterior Rhind of the Orange fresh, separated by a grater, a pound; Refined Sugar, three pounds. Bruise the Rhind in a stone mortar with a wooden pestle, then adding the sugar, bruise again until they unite into a mass."

Conserva Aurantii. Conserve of Orange Peel. Dub.

"To the Rhind of the fresh Seville Orange rasped off, add, while beating it, three times its weight of refined sugar."

Confectio Rosæ Caninæ. Confection of Dog-hip. Lond.

"Take of the Pulp of the Dog-hip, a pound; Refined Sugar, beat down, twenty ounces. Expose the pulp in a water-bath to a gentle heat,

then gradually add the sugar, and rub them together until they form an uniform mass."

Confectio Rosæ Gallicæ. Confection of the Red Rose. Lond.

"Take of the Petals of the Red Rose, not fully blown, with the heels removed, a pound; Refined Sugar, three pounds. Bruise the petals in a stone mortar, then, adding the sugar, beat again until they form an uniform mass.

Conserva Rosæ. Conserve of Red Rose. Dub.

"Pluck off the Petals of the Red Rose-buds, from the calyces, and having freed them from the heels, beat them, adding gradually three times their weight of refined sugar."

Of the above Conserves, that of Orange Peel is so little used, that it is seldom to be found in the shops. The Conserve of Dog-hip is smooth and uniform in its consistence, and is therefore well adapted to the purpose to which it is applied, that of serving as a vehicle for active medicines, under the form of bolus or pill. The Conserve of the Petals of the Red Rose is supposed to retain their slight astringency, and at one time was celebrated as a remedy in hæmoptysis and phthisis. It is still a popular medicine in these diseases, being taken in the dose of an ounce in the morning, diffused in warm milk.

The Confections of the London Pharmacopœia, which correspond with the Electuaries of the other Pharmacopœias, will be noticed in a succeeding chapter.

CHAP. IV.

SUCCI SPISSATI.—INSPISSATED JUICES.

The juice expressed from succulent vegetables, frequently holds dissolved, or diffused through it, the principles in which the medicinal powers of the plant reside; mucilage, the principle more peculiarly named extract, tannin, fecula, and even a portion of resin. But containing a large proportion of water, and being liable to decomposition, the process of inspissation is employed to obtain the active matter in a more concentrated state, and to obviate this spontaneous change. The preparations thus obtained are named Inspissated Juices, formerly Extracts.

In the greater number of cases, however, this operation cannot be performed without injury to the active matter. Any volatile principle is necessarily dissipated; and even where there is no injury of this kind, the vegetable matter, at the temperature necessary for the evaporation, suffers decomposition, either from the reaction of its elements, or from the chemical action of the oxygen of the air. Extractive matter, such as that contained in the juices of plants, becomes insoluble from mere exposure to the air, as Vauquelin observed: this change takes place more rapidly at the temperature of boiling water, as Fourcroy has shewn; and T. Saussure, who examined these changes more minutely, found that they are accompanied with an absorption of oxygen from the air, and a formation of carbonic acid, with probably, likewise, as he inferred, a formation of water

from the union of part of the oxygen and hydrogen of the vegetable matter. Such changes must give rise to alterations in the medicinal powers of these substances, and hence we cannot rely on the activity and uniformity of operation in these inspissated juices. Even after they are prepared, too, they continue to suffer spontaneous decomposition, and their activity must diminish with age.

From the analysis of these inspissated juices, they appear to contain usually a large proportion of saline matter, principally acetates of potash, lime, and ammonia, sulphate and muriate of potash, and sulphate of lime, with frequently so much free acetic acid as to redden litmus ; they exhale vapours of acetic acid when acted on by sulphuric acid, and they give an ammoniacal smell when rubbed with lime. This predominance of saline matter must modify their powers, and probably hasten their decomposition.

The Edinburgh Pharmacopœia gives the following general directions for preparing the inspissated juices.

"The fresh leaves are to be bruised, and being inclosed in an hempen bag, are to be pressed strongly, that they may give out their juice, which is to be reduced by evaporation in open vessels, heated by boiling water saturated with muriate of soda, to the consistence of thick honey. The mass, after it has cooled, is to be kept in glazed earthen vessels, and moistened with alcohol."

In this manner inspissated juices are obtained from the leaves of Wolfsbane, (Aconitum Napellus ;)—from the leaves of the Deadly Nightshade, (Atropa Belladonna ;)—from the leaves of Hemlock, (Conium Maculatum ;)—from the herb of Henbane, (Hyoscyamus Niger ;)—from the herb of Garden Lettuce, (Lactuca Sativa ;)—and from the herb of Strong-scented Lettuce, (Lactuca Virosa). The London College admit the same Inspissated Juices, with the exception of the last, giving them the name of Extracts. They give the following directions with regard to each. "Bruise the recent leaves in a stone mortar, sprinkling upon them a small quantity of water, then express the juice, and without any defecation evaporate it until it attain a proper consistence ;" the general direction being also given with regard to the evaporation, "that it is to be performed in a broad shallow vessel, by the heat of a water-bath, until the consistence is that fit for forming pills, stirring constantly with a spatula towards the end of the evaporation." The Dublin College admit only the Inspissated Juices of Hemlock and Henbane, giving the following directions under the preparation of the former. "Express the leaves of Hemlock, gathered when the flowers are just appearing, and put aside the juice for six hours, that the impurities may subside, then evaporate the pure juice with a gentle heat to the consistence of an extract." The propriety of the direction of allowing any matter to subside from the juice before evaporation, is doubtful, as the matter deposited has frequently considerable activity. It is not given, therefore, by the other Colleges, and the London College order even the juice to be evaporated without any purification.

Succus Spissatus Aconiti Napelli. Inspissated Juice of Wolfsbane. Ed. Extractum Aconiti. Extract of Wolfsba . Lond.

This inspissated juice is the form under which Wolfsbane was introduced into practice by Störk. He recommended it in glandular swellings, scrofulous and venereal affections, gout, and in obstinate chronic rheumatism, in

a dose of a grain night and morning, and gradually increased to 5 or 6 grains. It is very seldom prescribed.

Succus Spissatus Atropæ Belladonæ. Inspissated Juice of Deadly Nightshade. Ed. Extractum Belladonæ. Lond.

This has been recommended by the German practitioners in scirrhus, cancer, in epilepsy and mania, in a dose of one grain, usually in the form of a pill, gradually increased. It retains the peculiar property of the plant, that of occasioning dilatation of the pupil, whence it has been prescribed in amaurosis, and has frequently been employed previous to the operation for cataract.

Succus Spissatus Conii Maculati. Inspissated Juice of Hemlock. Ed. Succus Spissatus Cicutæ. Dub. Extractum Conii. Lond.

Under this form, hemlock was employed by Störk in scirrhus and cancer. The dose given is at first two grains, but it requires to be quickly increased, and it has at length been taken to the extent of several drachms in the day. It retains the strong odour of the plant, and seems to be one of the most powerful of the expressed juices. It is always liable, however, to be uncertain in its strength, according to the heat applied in its evaporation; it is also injured by keeping, and we have no other test of its activity than the strength of its narcotic odour. It is, therefore, on the whole, inferior to the dried leaves of the plant, though these are likewise liable to a considerable degree of uncertainty, according to the manner in which they have been dried and preserved.

According to Dr. Fothergill, the proper time for gathering this plant for medicinal purposes, and thus obtaining a medicine always nearly about the same strength, is when its flowers fade, the rudiments of the seed become apparent, and the habit of the plant inclines to yellow. Yet with all these precautions, it cannot be procured always of the same strength; and it is only from observing the effects it produces on the constitution, that we can at all determine whether it has been given in sufficient quantity to answer the end it was intended for. The effects usually observable when a full dose has been given, are giddiness, nausea, tremors of the body, a gentle catharsis, and sometimes a peculiar heavy sensation about the eyes.

A common form of exhibition is that of the inspissated juice made into pills by the addition of the powder of the leaves; but perhaps the powder alone is to be perferred, both as being in general more active and uniform, and as we have a test of its proper preparation more certain in the richness of its green colour.

Succus Spissatus Hyoscyami Nigri. Inspissated Juice of Black Henbane. Ed. Dub. Extractum Hyoscyami. Lond.

This inspissated juice retains a considerable degree of narcotic power, and is a form under which Henbane is occasionally employed as a substitute for opium. The dose has been usually one grain increased to a scruple, commonly in the form of pills; two grains are perhaps not more than equivalent to one grain of opium. The tincture has been introduced as a more certain preparation.

Succus Spissatus Lactucæ Sativæ. Inspissated Juice of Garden Lettuce. Ed.

This preparation was received into the last edition of the Edinburgh Pharmacopœia. It was first recommended by Dr. Duncan sen. for its sedative properties, and as such has been frequently employed principally in

allaying the cough attending phthisis pulmonalis. From the experiments of Dr. Coxe of Philadelphia, its action on the pulse, and the general effects produced by it, are nearly similar to those of laudanum. The dose in which it is given is from three to five grains.

Succus Spissatus Lactucæ Virosæ. Inspissated Juice of Strong-scented Lettuce. Ed.

This plant, though a narcotic, has been principally used as a diuretic. It was recommended as a remedy in dropsy by the German practitioners, in a dose of four or five grains, gradually increased to one or two drachms in twenty-four hours; in this country it has been little used.

Succus Spissatus Sambuci Nigræ. Inspissated juice of the Black Elder. Ed.

Five parts of the juice of ripe Elder Berries, and one part of purified Sugar, are to be boiled with a gentle heat to the consistence of thick honey.

Succus Spissatus Sambuci. Inspissated Juice of Elder. Dub.

Let the juice from the fresh Berries of the Elder be prepared in the same manner as the inspissated juice of hemlock.

This preparation has been given as an aperient or moderate laxative and diuretic, in a dose of half an ounce, or one ounce; but it possesses no quality to recommend it.

Extractum Elaterii. Extract of Elaterium. Lond.

"Cut the ripe fruit of Elaterium, and strain the juice very lightly expressed through a fine hair-sieve into a class vessel; then put it aside for a few hours, until the thicker part subsides. The thinner part which swims above being rejected, dry the thinner part with a gentle heat."

Elaterium. Elaterium. Dub.

"Cut ripe Wild Cucumbers, and strain the juice lightly expressed through a very fine hair-sieve into a glass vessel. Put it aside for some hours until the thicker part subsides; the liquid above being rejected, dry the fecula on a linen cloth, covered by another, with a gentle heat."

From the mode of preparation, it is obvious that this consists of a matter which had been suspended in the juice: hence it has been regarded as a species of fecula, without having been, however, very particularly examined; and from its not being dissolved during the slight boiling of the juice, it would appear to be of a different nature. Its active principle, according to Dr. Clutterbuck, appears to reside solely in the juice around the seeds; and this, when properly extracted, acts as a violent purgative in the small dose of $\frac{1}{8}$ grain.* It has been used as a hydragogue in dropsy, and as a cathartic in obstinate constipation; and used for this purpose, its action is peculiar, as it produces a great degree of febrile excitement. The violence, and in some measure, the uncertainty of its operation, prevents its frequent use; though in dropsy, where other powerful evacuants have not succeeded, it is sometimes tried in small repeated doses, cautiously administered.

* Vide p. 195.

CHAP. V.

OLEA FIXA SIVE EXPRESSA.—FIXED OR EXPRESSED OILS.

These Oils were formerly denominated Expressed in the Edinburgh Pharmacopœia, which name is retained in those of the London and Dublin Colleges; but as several of the volatile oils are obtained by expression, the Edinburgh College have appropriated the term Fixed to that class of oils.

The fixed or expressed oils are distinguished by their unctuosity and insipidity, by being insoluble in water and in alcohol, incapable of volatilization without change, and by combining with the alkalis, forming soaps.

The ultimate principles of these oils, are hydrogen and carbon. They exist in the fruit and seeds of vegetables, and are obtained by expression, or decoction with water. The former method is in general to be preferred; and to afford the oil pure, it must be performed without heat, which, though it favours the separation of the oil, communicates to it acrimony and an unpleasant flavour. The process, however, is seldom performed in the shops. To preserve them from becoming rancid, they ought to be kept secluded from the air, this change being produced in them by absorption of oxygen.

A process in Pharmacy somewhat difficult, is to mix these oils with any watery fluid, so that they may be conveniently exhibited. It is usually done by the medium of mucilage, or of an alkali. If triturated with mucilage, and a small quantity of sugar, the oil is diffused through the water, and a milky liquor is formed, in which, however, the diffusion is rather imperfect. A combination more complete and permanent is effected, by adding a few drops of water of ammonia, or two or three grains of subcarbonate of potash, without the mucilage.

Oleum Amygdalæ Communis. Oil of Almonds. Ed.

"Take of Fresh Almonds, any quantity. Bruise them in a stone-mortar, inclose them in a hempen bag, and express the oil by a press without heat."

Oleum Amygdalarum. Almond Oil. Lond.

"Macerate Almonds, either sweet or bitter, in cold water for twelve hours, and bruise them; then, without applying any heat, express the oil."

Oleum Amygdalarum. Oil of Almonds. Dub.

"Bruise Fresh Almonds in a mortar, and express the oil without heat, by a press."

This is the purest of the expressed oils, being free from odour or taste. It is used as a demulcent, and for the general purposes to which expressed oils are applied.

Oleum Lini Usitatissimi, Oil of Lintseed: Oleum Lini Lond. and Dub.

This oil is directed to be expressed in the same manner, from the seeds of the plant. Being less pure, it is used only as an external application. Usually, it is prepared on the large scale; and to remove the mucilage, heat is employed in the expression.

Oleum Ricini. Castor Oil. Lond. "Bruise the seeds from which the external pellicle has been removed, and express the oil without any application of heat."

This oil is usually prepared in the West Indies by decoction, and is milder than when obtained by expression. Hence in the Pharmacopœias of the other colleges, it is merely inserted in the catalogue of the Materia Medica.

This is the case too with the Olive Oil, Oleum Oleæ Europææ, which of all the expressed oils is most largely employed; it is imported from the South of Europe.

CHAP. VI.

EMULSIONES. EMULSIONS. ED.—MISTURÆ. MIXTURES. LOND.

Emulsions are preparations in which the expressed oil of the seeds or kernels, from which they are made, is diffused through water by the medium of the sugar, mucilage, and fecula, which the seeds contain. They may be made from lintseed, from the seeds of the poppy, and from other oily seeds, but almonds are always preferred, as being free from any disagreeable flavour or taste; and they afford a much more grateful form of preparation of an expressed oil than any other. They are employed as mere demulcents, and are always extemporaneous preparations. The oil being merely diffused through the water, they are opaque and milky, and after some time it begins to separate and rise like a cream to the surface. The fluid beneath is like whey in its appearance, and soon becomes acescent from the slow fermentation of the saccharine matter. The addition of vinous spirits, or of any weak acid, decomposes emulsions, separating the oil. In prescribing them, therefore, it is necessary to avoid combining with them any tincture, or any substance having acidity.

Emulsio Acaciæ Arabicæ. Arabic Emulsion. Ed.

"Take of the Mucilage of Gum-Arabic, two ounces; Almonds, one ounce; Refined Sugar, an ounce and a half; Water, two pounds and a half. Macerate the almonds in warm water and peel them, then carefully beat them in a stone mortar, first with the sugar, and next with the mucilage; the water is then to be gradually added, and the mixture strained."

Emulsio Arabica. Arabic Emulsion. Dub.

"Take of Gum-Arabic, in powder, two drachms; Sweet Almonds, blanched, Refined Sugar, of each half an ounce; Decoction of Barley, a pint. Dissolve the gum in the warm decoction, and when it is nearly cold, pour it gradually on the almonds, previously triturated with the sugar, rubbing them at the same time together, so as to form a milky liquor, which strain."

This emulsion is used in the same cases as those following, and from the addition of the mucilage, is supposed to have more demulcent power.

Emulsio Amygdali Communis. Almond Emulsion. Ed.

"Take of Sweet Almonds, one ounce; Purified Sugar, half an ounce; Water, two pounds and a half; beat the blanched almonds carefully in a stone mortar with the sugar, adding the water gradually, then strain."

Lac Amygdalæ. Milk of Almonds. Dub.

"Take of Sweet Almonds, blanched, an ounce and a half; Refined Su-

gar, half an ounce, Water, two pints and a half. Triturate the almonds with the sugar, adding the water gradually, then strain."

Mistura Amygdalarum. Mixture of Almonds. Lond.

"Take of Almond Confection, two ounces; Distilled Water, a pint; add the water gradually to the confection during the trituration, and then strain."

The almonds are blanched, are freed from their thin rhind, by keeping them a minute or two in boiling water, and after which the rhind is easily detached. They require to be well triturated with the first portions of water, as it is added. The formula of the London College affords a method of preparing the emulsion more easily, extemporaneously; but this is an advantage scarcely of sufficient importance to require an alteration of the mode of preparation; and the almond confection, if long kept, may be liable to spontaneous decomposition, and probably, from the sugar it contains, will become acescent, and therefore unfit for the preparation. The emulsion is used as a diluent and demulcent in catarrh and gonorrhœa, or during the application of a blister, to prevent the occurrence of strangury, being drunk *ad libitum*, and it is more grateful than any other diluent.

Emulsio Camphoræ. Camphor Emulsion. Ed.

"Take of Camphor, one scruple; Almonds, Refined Sugar, of each half an ounce; Water, a pound and a half. Beat the blanched almonds in a stone mortar, with the camphor and sugar previously well rubbed together, then pour the water on gradually, and strain."

Camphor is less apt to occasion nausea or uneasiness in the stomach when given in a liquid than when in a solid form; and this is one of the best forms of preparation for its diffusion. Its dose is two ounces, given every four hours; but as this narcotic is not much employed internally in modern practice, the camphor emulsion is not often prescribed. This preparation should always be extemporaneous, as in the course of a few days the camphor separates, and rises to the surface.

MISTURÆ.—MIXTURES.

To the preparations named Emulsions, the London College have extended the general name of Mixture, which is employed in Pharmacy to denote those preparations in which different ingredients are mingled together in the liquid form, or in which solid substances are diffused through liquids by the medium of mucilaginous or saccharine matter. And under the name of Mixture are inserted several compound medicines, both in the London and Dublin Pharmacopœia, of which it is necessary to take notice. Some of them had formerly a place in the Edinburgh Pharmacopœia; but they have been discarded, probably from the consideration that they must always be prepared extemporaneously, and may therefore be varied according to the intention of the prescriber.

Mistura Ammoniaci. Gum Ammoniac Mixture. Lond.

"Take of Ammoniac, two drachms; Water, half a pint. Triturate the ammoniac with the water poured on it gradually until they are intimately mixed."

Lac Ammoniaci. Milk of Ammoniac. Dub.

"Take of Gum Ammoniac, one drachm; Pennyroyal Water, eight ounces

by measure. Rub the gum with the pennyroyal water added gradually, until the mixture has the appearance of milk, which strain through linen."

In this mixture the resinous matter is suspended in the water by the medium of the gum, and a milky liquor is formed. From this the resin subsides slowly. Under this form this gum-resin is sometimes prescribed as an expectorant, the dose of the mixture being from half an ounce to an ounce: the bitter taste, however, of ammoniac renders it not so well adapted to its exhibition as the form of pill.

Mistura Assafœtidæ. Assafœtida Mixture. Lond.
"Take of Assafœtida, two drachms; Water, half a pint. Rub the assafœtida with the water added gradually until they are perfectly mixed."
Lac Assafœtidæ. Milk of Assafœtida. Dub.
"Take of Assafœtida, a drachm; Pennyroyal Water, eight ounces by measure. Rub the assafœtida with the water gradually added, until it form an emulsion."

The resin of the assafœtida is in this mixture likewise suspended in the water by the medium of the gum. It is a form under which this fœtid drug is prescribed in the hysteric paroxysm, from half an ounce to an ounce being given and repeated at short intervals. Its operation as an antispasmodic is thus sooner obtained than when it is given in the solid form.

Mistura Camphoræ. Camphor Mixture. Lond.
"Take of Camphor, half a drachm; Rectified Spirit, ten minims; Water, a pint. Rub the camphor first with the spirit, then add the water gradually and strain."
Mistura Camphorata. Camphorated Mixture. Dub.
"Take of Camphor, a scruple; Rectified Spirit of Wine, ten drops; Refined Sugar, half an ounce; Water, a pint. Rub the camphor first with the spirit, then with the sugar; lastly, add the water while rubbing, and strain the mixture through linen."

Boiling water was formerly ordered in making this mixture, by which much of the camphor was volatilized, and very little of it dissolved. Even at a low temperature, the water scarcely dissolves any appreciable quantity, and it can be regarded only as receiving odour and some degree of taste, without any such impregnation as shall communicate to it medicinal efficacy. It serves, therefore, merely as a vehicle for other medicines.

Mistura Cornu Usti. Mixture of Burnt Horn. Lond.
"Take of Burnt Horn, two ounces; Gum Arabic in powder, one ounce; Water, three pints. Boil down to two pints, stirring constantly, then strain."
Decoctum Cornu Cervini. Decoction of Hartshorn. Dub.
"Take of Burnt Hartshorn, rubbed to powder, two ounces; Gum Arabic, three drachms; Water, three pints. Boil, stirring constantly, to two pints, and strain."

This is an absured preparation, introduced at a time when the principles of Pharmacy were nearly unknown. The burnt hartshorn (which is chiefly phosphate of lime) is perfectly insoluble in water; the gum alone therefore is dissolved; the hartshorn, by the continued boiling, is diffused, and kept suspended by the mucilaginous liquid; but this might equal-

ly be done without this operation; and when done, it can communicate to the preparation no medicinal power whatever.

Mistura Ferri Composita. Compound Mixture of Iron. Lond.

"Take of Myrrh in powder, one drachm; Sub-carbonate of Potash, twenty-five grains; Rose Water, seven fluidounces and a half; Sulphate of Iron in powder, one scruple; Spirit of Nutmeg, half a fluidounce; Refined Sugar, a drachm.

"Rub the myrrh with the sub-carbonate of potash and sugar, and, during the rubbing, add first the rose water, and the spirit of nutmeg, and afterwards the sulphate of iron. Put the mixture immediately into a proper glass vessel, which stop closely."

This, with a few trivial alterations, is the celebrated Antihectic Mixture of Griffith; which, as first invented, was undoubtedly an unchemical mixture, the prescriber not being aware of the changes produced in the active ingredients by their mutual action, but which, in practice, was found possessed of some peculiar advantages. The sulphate of iron, it is obvious, is decomposed by the sub-carbonate of potash, the sulphuric acid combining with the potash, while the carbonic acid unites with the oxide of iron. The carbonate of iron which is formed, is diffused in the mixture with the myrrh, and both are probably kept more completely suspended by an excess of alkali. This chalybeate proves less irritating than the sulphate of iron, producing no unpleasant effect on the stomach, and at the same time is more active than the common carbonate or rust of iron, in which the iron is at the maximum of oxidation, while in the present preparation, it is at the minimum, is in a different state of aggregation, and probably combined with a larger quantity of carbonic acid. To preserve it in this state, it is ordered to be kept in a bottle closely stopt; but as iron has a strong tendency to become more highly oxidated, and suffers this change rapidly from the action of the air, it is preferable that the preparation should be extemporaneously made. Griffith's mixture is employed as a remedy in hectic fever, in some forms of phthisis and chronic catarrh, in chlorosis, and other diseases in which iron is given as a tonic, and is often attended with marked benefit. The mixture of the London Pharmacopœia is nearly of the same strength, and may be given in a dose of an ounce once or twice a-day.

Mistura Guaiaci. Guaiac Mixture. Lond.

"Take of the Gum-Resin of Guaiac, a drachm and a half; Refined Sugar, two drachms; Mucilage of Gum Arabic, two fluid-drachms; Cinnamon Water, eight fluidounces. Rub the guaiac with the sugar, then with the mucilage, adding gradually, while these are rubbed together, the cinnamon water."

This may be a convenient form for the exhibition of guaiac, but is not possessed of any very peculiar advantage; nor does there appear to be much propriety in multiplying these extemporaneous prescriptions.

Mistura Moschi. Musk Mixture. Lond.

"Take of Musk, Gum Arabic, Refined Sugar, of each one drachm; Rose Water, six fluidounces. Rub the musk with the sugar, then with the gum, and add gradually the rose water."

The same observation applies to this as to the preceding preparations. Its dose is an ounce, or an ounce and a half.

Aqua Picis Liquidæ. Tar-Water. Dub.

"Take of Tar, by measure, two pints; Water, a gallon. Mix them, stirring with a wooden rod for a quarter of an hour; then, after the tar has subsided, strain the liquor, and keep it in well-closed vessels."

The water dissolves the empyreumatic acetic acid with a little of the oil of the tar, and from this impregnation acquires colour, smell, and taste. Tar-water was at one time highly celebrated for its efficacy in many diseases, being drunk to the extent of a pound or two daily; it operates slightly as a diuretic and diaphoretic, but has long fallen into disuse.

CHAP. VII.

INFUSA.—INFUSIONS.

Infusion is a general term, which might be applied to that process by which the soluble parts of any solid are extracted by the action of any fluid kept in contact for some time with the body on which its acts. In Pharmacy it is usually limited to that case where the active matter of vegetable substances is extracted partially or completely by water, though it is sometimes extended to the same process where other liquors, as alcohol, are employed. It is in the former sense, or as denoting an aqueous preparation, that the term is used in the pharmacopœias. Infusions, therefore, are solutions of vegetable matter in water obtained by maceration.

Several of the principles of vegetables being soluble in water, they can often, by this operation, be extracted with advantage. But there are others with regard to which it is useless. Thus the astringent power of oak bark, or the purgative quality of rhubarb, is extracted by infusion in water: even the cathartic power of senna, though it appears to reside in a principle more peculiarly soluble in alcohol, is obtained by the action of water, when a large quantity is employed, and its solvent power is promoted by heat. But the power of jalap is scarcely procured, the watery infusions of it being comparatively weak. In prescribing infusions, therefore, regard must be had to the composition of the substance ordered to be infused. In general, mucilaginous plants yield their mucilage readily to water; bitterness and astringency are also usually extracted by water with facility, and the aromatic quality where this resides is an essential oil. With regard to other properties, scarcely any general rule can be delivered. To any resinous substance aqueous infusion can never be properly applied.

The quantity and quality of the matter extracted by infusions are varied by the temperature of the fluid. Infusions with warm water are considerably stronger than those made with cold water; in some cases, however, especially with respect to bitters, they are less grateful. In the infusion of gentian, therefore, of the Edinburgh Pharmacopœia, which is designed to be used as a bitter, cold water is directed to be used; in all the others, boiling water is ordered to be poured on the materials of the infusion, and the vessel is generally placed near a fire.

Dried vegetables yield their virtues to water by infusion, more readily than when they are in the recent state, probably from the vegetable matter being more easily penetrated by the water.

Infusions are always injured by keeping. Though at first transparent, they soon become more or less turbid; they deposit a mucous-like substance, lose their peculiar taste, and after some time acquire a putrid smell,—changes owing to the gradual decomposition of the vegetable matter they hold dissolved. Infusions are therefore never kept ready prepared in the shops; they are to be regarded as extemporaneous preparations, which, in general, require several hours before they can be prepared.

Infusum Acaciæ Catechu. Infusion of Catechu. Ed.

"Take of Extract of Acacia Catechu in powder, two drachms and a half; Bark of Cinnamon bruised, half a drachm; Boiling Water, seven ounces; Simple Syrup, one ounce. Macerate the extract and bark with the water in a closed vessel, for two hours, then strain through linen, and add the syrup."

Infusum Catechu Compositum. Compound Infusion of Catechu. Lond.

"Take of Extract of Catechu, two drachms and a half; Cinnamon Bark bruised, half a drachm; Boiling Water, half a pint. Macerate for an hour in a vessel lightly closed, and strain."

The Extract of Catechu is entirely soluble in water. This preparation, therefore, possesses all its virtues unimpaired, and rendered more grateful by the addition of the cinnamon. Hence it is one of the best forms under which catechu can be prescribed. Its principal use is in diarrhœa: its dose, one ounce every third or fourth hour. A small quantity of tincture of opium is frequently added to it with advantage.

Infusum Anthemidis Nobilis. Infusion of Chamomile. Ed.

"Take of Chamomile Flowers, two drachms; Water, eight ounces. Macerate for twenty-four hours, in a vessel lightly closed, and strain."

Infusum Anthemidis. Infusion of Chamomile. Lond.

"Take of Flowers of Chamomile, two drachms: Boiling Water, half a pint. Macerate for ten minutes in a vessel lightly closed, and strain."

Under the form of infusion, chamomile is used as a bitter in dyspepsia: it is more grateful when prepared with cold water, and then is equal perhaps in efficacy to any other bitter. The infusion in warm water is generally employed to promote the operation of an emetic.

Infusum Cassiæ Sennæ. Infusion of Senna. Ed.

"Take of the Leaves of Senna, six drachms; Ginger Root bruised, one scruple; Boiling Water, nine ounces. Macerate for an hour, in a vessel lightly closed, and strain."

Infusum Sennæ. Infusion of Senna. Lond.

"Take of Senna Leaves, an ounce and a half; Ginger root sliced, one drachm; Boiling Water, a pint. Macerate for an hour in a vessel lightly closed, and strain the liquor."

Infusum Sennæ. Infusion of Senna. Dub.

"Take of Senna Leaves, three drachms; Lesser Cardamom Seeds, freed from the capsules and bruised, half a drachm; Boiling Water, as much as that six ounces by measure may be strained off. Digest for an hour, and when the liquor has cooled, strain it."

Under this form, senna may be given as a purgative, the dose being three or four ounces. It is however less grateful than the infusion of senna and tamarinds of the Edinburgh Pharmacopœia. The proportion of senna in

the London formula, appears to be considerably greater than what is necessary; and there is no propriety in preparing more of the infusion than what is required for a dose, as it suffers decomposition in a very short time.

INFUSUM CINCHONÆ LANCIFOLIÆ. Infusion of Peruvian Bark. Ed.

"Take of Lance-leaved Bark in powder, one ounce; Water, one pound. Macerate for twenty-four hours, frequently shaking, and strain."

INFUSUM CINCHONÆ. Infusion of Peruvian Bark. Lond.

"Take of Lance-leaved Peruvian Bark, bruised, half an ounce; Boiling Water, half a pint. Macerate for two hours in a vessel lightly closed, and strain."

INFUSUM CINCHONÆ SINE CALORE. Infusion of Peruvian Bark without heat. Dub.

"Take of Peruvian Bark in coarse powder, an ounce; Cold Water, twelve ounces, by measure. Rub the bark with a little water, and add the remainder during the rubbing; then macerate for twenty-four hours, shaking occasionally, and pour off the pure liquor."

By infusion, water is capable of dissolving only a small portion of the active matter of cinchona, and the preparation thereof cannot be employed with advantage in any case in which the full operation of the remedy is required. It is used as a bitter in dyspepsia, in a dose of two ounces occasionally, but is seldom prescribed.

INFUSUM COLUMBÆ. Infusion of Columbæ. Ed.

"Take of Colombo Root sliced, one drachm; Boiling Water, eight ounces. Macerate for two hours in a vessel lightly closed, and strain."

INFUSUM COLUMBÆ. Infusion of Colombo. Lond.

"Take of Colombo Root cut, one drachm; Boiling Water, half a pint. Macerate for two hours in a vessel lightly closed, and strain."

The active matter of colombo is imperfectly extracted by water; and this can be regarded only as a bitter infusion, which, like other bitters, may be used in dyspeptic affections. Its dose is two ounces. To obtain the more active operation of colombo, it must be given in substance.

INFUSUM DIGITALIS PURPUREÆ. Infusion of Foxglove. Ed.

"Take of the dried leaves of Foxglove, one drachm; Boiling Water, eight ounces; Spirit of Cinnamon, one ounce. Macerate the leaves in the water for four hours in a vessel lightly covered, and after adding the spirit, strain."

INFUSUM DIGITALIS. Infusion of Foxglove. Lond.

"Take of the dried leaves of Foxglove, one drachm; Boiling Water, half a pint. Macerate for four hours in a vessel lightly closed, and strain; then add of spirit of cinnamon, half a fluidounce."

Infusion is the form under which Dr. Withering, who introduced the use of digitalis in dropsy, recommended it to be given, and it is on the whole the best form, with the view at least to obtain its diuretic operation. The above is the formula of Withering; the addition of the aromatic is designed to counteract the nauseating effect. Its dose is an ounce taken twice a-day, and continued till the effects of the remedy appear.

INFUSUM GENTIANÆ COMPOSITUM, *vulgo Infusum Amarum.* Compound Infusion of Gentian. Ed.

"Take of Gentian Root cut, half an ounce; Dried Orange-Peel bruised,

Coriander Seeds bruised, of each a drachm; Diluted Alcohol, four ounces; Water, one pound. First pour on the alcohol, and after three hours the water; then macerate for twelve hours, in a vessel lightly closed, and strain."

INFUSUM GENTIANÆ COMPOSITUM. Compound Infusion of Gentian. Lond.

"Take of Gentian Root cut, Orange-Peel dried, of each a drachm; Fresh Lemon Peel, two drachms; Boiling Water, twelve fluidounces. Macerate for an hour, in a vessel lightly closed, and strain."

INFUSUM GENTIANÆ COMPOSITUM. Compound Infusion of Gentian. Dub.

"Take of Gentian Root bruised, two drachms; Fresh Lemon-Peel, half an ounce: dried Orange-Peel, a drachm and a half; Proof-Spirit, four ounces by measure; Boiling Water, twelve ounces by measure. Pour on first the spirit, and after three hours, the water; macerate for two days, and strain."

This bitter infusion is employed in dyspepsia: a sufficient quantity of alcohol is added to aid the solvent power of the water, and to preserve the infusion from spontaneous decomposition, while there is not so much as to give spiritous pungency. It is therefore better adapted to continued use than the bitter tinctures. Its dose is two ounces occasionally. The London College omit the alchol; and in an infusion which may always be extemporaneously prepared, and does not therefore require to be long kept, this is perhaps preferable, as avoiding the pernicious consequences arising from the stomach being accustomed to the stimulus of ardent spirit.

INFUSUM LINI USITATISSIMI. Infusion of Lintseed. Ed.

"Take of Lintseed, an ounce, Liquorice Root, bruised, two drachms; Boiling water, two pounds. Digest for four hours in a vessel lightly closed, and strain."

INFUSUM LINI. Infusion of Lintseed. Lond.

"Take of Lintseed bruised, one ounce; Liquorice Root cut, half an ounce; Boiling Water, two pints. Macerate for four hours, nigh the fire, in a vessel lightly closed, and strain."

The mucilaginous matter of Lintseed is very readily dissolved by tepid water; and this forms a demulcent liquor, often taken with advantage in gonorrhœa, dysuria, and sometimes in catarrh. It is rendered rather more grateful by the addition of a small portion of lemon juice, and of the rhind of the lemon with a little sugar.

INFUSUM QUASSIÆ EXCELSÆ. Infusion of Quassia. Ed.

"Take of Quassia Wood, rasped, half a drachm; Boiling Water, eight ounces. Macerate for two hours in a vessel lightly closed, and strain."

INFULUM QUASSIÆ. Infusion of Quassia. Lond.

"Take of the Wood of Quassia cut, one scruple; Boiling Water, half a pint. Macerate for two hours, in a vessel lightly closed, and strain."

Quassia is a very pure bitter, and its bitterness is extracted by water. Under this form it is used as a remedy in dyspepsia. Its dose may be two ounces.

INFUSUM RHEI. Infusion of Rhubarb. Ed.

"Take of the Root of Rhubarb bruised, half an ounce; Boiling Water, eight ounces; Spirit of Cinnamon, one ounce. Macerate the root with the water in a closed vessel for twelve hours, then, adding the spirit, strain the liquor.

INFUSUM RHEI. Infusion of Rhubarb. Lond.

"Take of Root of Rhubarb cut, a drachm; Boiling Water, half a pint. Macerate for two hours in a vessel lightly closed, and strain."

The infusion of rhubarb is supposed to have more of the purgative than of the astringent power. It is accordingly used as a mild cathartic, in a dose of two or three ounces. There appears to be an unnecessary waste of rhubarb in the formula of the Edinburgh Pharmacopœia; and that in the London Pharmacopœia, in which only a drachm of rhubarb is ordered to eight ounces of water, will probably afford as much active matter as the water can dissolve, or at least will give an infusion sufficiently strong.

INFUSUM ROSÆ GALLICÆ. Infusion of Red Rose. Ed.

"Take of the Dried Petals of the Red Rose, one ounce; Boiling Water, two pounds and a half; Dilute Sulphuric Acid, half an ounce; Refined Sugar, one ounce. Macerate the petals with the boiling water in an earthen vessel, which is not glazed with lead, for four hours, then, having poured on the acid, strain the liquor, and add the sugar."

INFUSUM ROSÆ. Infusion of Rose. Lond.

"Take of the Dried Petals of the Red Rose, half an ounce; Boiling Water, two pints and a half; Diluted Sulphuric Acid, three fluid-drachms; Refined Sugar, an ounce and a half. Pour the water on the petals in a glass vessel; then drop in the acid, and macerate for half an hour.—Lastly, strain the liquor, and add the sugar to it."

INFUSUM ROSÆ. Infusion of Rose. Dub.

"Take of the Dried Petals of the Red Rose, freed from the heels, half an ounce; Diluted Sulphuric Acid by weight, three drachms; Boiling Water, three pints; Refined Sugar, an ounce and a half. Pour first the water on the petals in a glass vessel; then add the acid, and digest for half an hour, strain the cold liquor, and add the sugar."

This infusion is used principally as a moderately astringent gargle, in slight cases of cynanche, or to check salivation. It owes little else than colour, and a pleasant flavour, to the petals of the rose; the astringency depending almost entirely on the sulphuric acid.

INFUSUM SENNÆ COMPOSITUM. Compound Infusion of Senna. Ed.

"Take of Senna Leaves, one drachm; Preserved Tamarinds, one ounce; Coriander Seeds bruised, one drachm; Raw Sugar, half an ounce; Boiling Water, eight ounces. Macerate them in a close earthen vessel, which, is not glazed with lead, shaking frequently, and, after four hours, strain. It may be made also with double or triple the quantity of senna."

INFUSUM SENNÆ CUM TAMARINDIS. Infusion of Senna with Tamarinds. Dub.

This infusion is prepared in the same manner as the simple infusion of senna, (already noticed), adding only an ounce of tamarinds before the affusion of the water.

This affords a purgative not ungrateful, mild in its operation, and not liable to excite nausea. The whole quantity may be taken at intervals as a dose. If a more powerful cathartic is indicated, it may be made with a larger proportion of senna. The direction of not infusing the materials in a vessel glazed with lead ought to be attended to, as the acid of the tamarinds acting on the lead, the infusion might receive a noxious impregnation.

There are some infusions peculiar to the Dublin and London Pharmacopœias.

Infusum Armoraciæ Compositum. Compound Infusion of Horse-Radish. Lond.

"Take of Fresh Horse-Radish Root cut, Mustard Seed bruised, of each one ounce; Boiling Water, a pint. Macerate for two hours in a vessel lightly closed, and strain; then add of Compound Spirit of Horse-Radish, a fluidounce."

Under this form the horse-radish may be prescribed in the diseases in which it is employed, more particularly as a stimulant in chronic rheumatism, paralysis, and some forms of dropsy, especially if they should occur after intermittents. Its dose is two ounces twice a-day.

Infusum Aurantii Compositum. Compound Infusion of Orange-Peel. Lond.

"Take of Dried Rhind of the Orange, two drachms; of Fresh Rhind of Lemon, one drachm; of Cloves bruised, half a drachm; Boiling Water, half a pint. Macerate for a quarter of an hour in a vessel lightly closed, and strain."

This affords a bitter, grateful, and somewhat pungent taste, which may be employed with advantage in some forms of dyspepsia. Its dose is two ounces.

Infusum Caryophyllorum. Infusion of Cloves. Lond.

"Take of Bruised Cloves, a drachm; Boiling Water, half a pint. Macerate for two hours in a vessel lightly closed, and strain."

The aromatic odour and pungency of the clove are extracted in this infusion; it may be used with advantage as a warm and grateful stimulant in some forms of dyspeptic affection, where a sensation of cold and uneasiness is felt at the stomach,—a state which is often produced where the habit of taking spiritous cordials has been indulged in. Its dose is a wine glassful.

Infusum Cascarillæ. Infusion of Cascarilla. Lond.

"Take of Cascarilla Bark bruised, half an ounce: Boiling Water, half a pint. Marcerate for two hours in a vessel lightly closed, and strain."

Cascarilla is a substance little valued in modern practice; and there does not appear to be much propriety in the introduction of this infusion as an officinal preparation. Its dose is two ounces.

Infusum Cuspariæ. Infusion of Angustura. Lond.

"Take of the Bark of Angustura bruised, two drachms; Boiling Water, half a pint. Macerate for two hours in a vessel lightly closed, and strain."

The same remark nearly applies to this preparation, as to the preceding one. Under this form, however, angustura may be occasionally used as a remedy in dyspepsia. The dose is two ounces.

Infusum Simaroubæ. Infusion of Simarouba. Lond.

"Take of the Bark of Simarouba bruised, half a drachm; Boiling Water, half a pint. Macerate for two hours in a vessel lightly closed, and strain."

Simarouba yields its bitterness to water; the infusion, however, is inferior to that of quassia, and does not appear to have any particular advantage to recommend it.

INFUSUM TABACI. Infusion of Tobacco. Lond.

"Take of the Leaves of Tobacco, one drachm; Boiling Water, a pint. Macerate for an hour, in a vessel lightly closed, and strain."

This infusion is prepared of that strength which is proper for giving tobacco under the forms of enema, as a narcotic in incarcerated hernia, or to produce evacuation from the intestines, in ileus and obstinate constipation.

INFUSUM MENTHÆ COMPOSITUM. Compound Infusion of Mint. Dub.

"Take of the Leaves of Spearmint dried, two drachms; Boiling Water, as much as is sufficient to afford six ounces of infusion when strained. Digest for half an hour in a covered vessel; strain the liquor when cold, and add to it, of Refined Sugar, two drachms; Oil of Spearmint, three drops, dissolved in half an ounce of compound tincture of cardamom."

This is a grateful stomachic, which may be used to obviate flatulence, or as a vehicle to cover the taste of unpleasant medicines.

INFUSUM VALERIANÆ. Infusion of Valerian.

"Take the root of Valerian, in course powder, two drachms; Boiling Water, seven ounces. Digest for an hour, and strain the liquor when it is cold."

Valerian is frequently taken in hysteric affections under the form of infusion, and this affords a preparation of proper strength. Its dose is from one to two ounces.

CHAP. VIII.

OF MUCILAGES.

THE term Mucilage, in Pharmacy, is applied to solutions of gummy matter in water, sufficiently concentrated to have a degree of viscidity; or to similar solutions obtained by the maceration of water and vegetables, in which this kind of matter abounds. They are principally employed as vehicles for other substances, either to suspend powders in liquids, to diffuse oils or resinous matter in water, or to give form and tenacity to pills.

MUCILAGO ACACIÆ ARABICÆ. Mucilage of Gum Arabic. Ed.

"Take of Gum Arabic, one part; Boiling Water, two parts. Digest with frequent agitation until the gum be dissolved, then strain through linen."

MUCILAGO ACACIÆ. Mucilage of Gum Arabic. Lond.

"Take of Gum Arabic in powder, four ounces; Boiling Water, half a pint. Rub the gum with the water, gradually added, until it form a mucilage."

MUCILAGO GUMMI ARABICI. Mucilage of Gum Arabic. Dub.

"Take of Gum Arabic in coarse powder four ounces; Boiling Water, eight ounces. Digest them, agitating frequently, so as to dissolve the gum: then strain through linen."

Mucilage of gum arabic is sometimes employed as the basis of the common demulcent mixtures used in catarrh. It is more generally used as an agent in Pharmacy, to suspend in water substances insoluble in that liquid, to diffuse oils in water, and for similar purposes.

MUCILAGO AMYLI. Starch Mucilage. Ed.

"Take of Starch, three drachms; Water, one pound. Rub the Starch with the water gradually added to it, then boil them for a short time."

MUCILLGO AMYLI. Lond.

"Take of Starch, three drachms; Water, a pint. Rub the starch, with the water gradually dropt upon it, then boil until it form a mucilage."

MUCILAGO AMYLI. Starch Mucilage. Dub.

"Take of Starch, half an ounce; Water, a pint. Rub the starch, adding the water gradually; then boil a little."

Starch is the fecula of wheat, and though insoluble in cold water, is dissolved by boiling water, and forms a gelatinous solution. The starch-mucilage is used as a vehicle for giving opium under the form of enema.

MUCILAGO ASTRAGALI TRAGACANTHÆ. Mucilage of Gum Tragacanth. Ed.

"Take of Gum Tragacanth, two drachms; Boiling Water, eight ounces. Macerate for twenty-four hours, and rub carefully, that it may be dissolved; then strain through linen."

MUCILAGO GUMMI TRAGACANTHÆ. Dub.

"Take of Gum Tragacanth in powder, two drachms; Water, eight ounces. Macerate in a close vessel until the gum is dissolved; then strain the mucilage through linen."

Tragacanth is not easily dissolved in water, and, even with the aid of heat, the viscid mucilaginous liquor that is formed remains turbid and flocculent. The proportion of the gum to the water is rather large in the Edinburgh Pharmacopœia, but is designed to form a stiff mucilage to be used principally in making troches.

CHAP. IX.

OF DECOCTIONS.

THE power of water as a solvent, is, like that of all other chemical agents, increased by heat. Hence, in general, the active matter of vegetable substances is extracted more completely by boiling them with water, than by mere infusion, either cold or warm, the residuum in the one case being found more inert than in the other.

It is not be concluded, however, from this fact, that the decoction is proportionally more powerful in medicinal operation. On the contrary, though the active matter of the substance is dissolved, it is often much injured in the operation; in few cases is the decoction equal in power to the quantity of the substance from which it is prepared; in many it is much

impaired; and in some it is totally lost, the decoction itself and the residual matter being both nearly inert.

This change is often owing to the dissipation of the volatile principles of the substance operated on. All the essential oils are volatilized at the temperature of boiling water. It is evident, therefore, that substances, whose virtues depend wholly or in part on their essential oil, must be injured by this operation: for this reason, aromatics are always useless additions to decoctions; and the aromatic flavour of many active substances is also lost in this form of preparation.

But there are many cases in which the virtues of medicines are injured by decoction, in which we cannot ascribe the injury to the dissipation of their active principles. The powers of opium, cinchona, and ipecacuan, for example, are much weakened by boiling in water; yet, when the operation is conducted in close vessels, so as to collect the water that is evaporated, that water is not found to be impregnated with the active matter of the substance operated on. The distilled water of opium has been given to the extent of six ounces, without exerting any great narcotic effect; and the distilled water of ipecacuan, though it proves emetic, is much less so than the simple infusion. Since, then, the active matter is neither to be found in this fluid which is evaporated, nor in that which remains, it is evident that it must have been destroyed in the operation, by decomposition of the principles on which it depends. It is accordingly found that some such change is induced. When a decoction is strained, so as to be transparent, and is subjected anew to boiling, it acquires a deeper colour, becomes turbid, an insipid substance being gradually formed, which is deposited. This change may be owing, either to the re-action of the elements of the vegetable matter being favoured by the humidity, and the high temperature, so that they enter into new combinations, or to the action of the air upon it imparting oxygen. Experiments have been brought in proof of this last circumstance taking place in some cases, especially in the decoction of Peruvian bark, oxygen being absorbed, combining with the extracto-resinous matter, and forming an insipid substance. This in particular is affirmed by Fourcroy. And it is farther rendered probable by the experiments of the younger Saussure, who found that extractive matter, in a humid or dissolved state, exposed to the air, was precipitated after a few days in an insoluble state; oxygen was absorbed; carbonic acid was also formed: and he concluded from the results, that while part of the carbon of the vegetable matter is abstracted by the action of the oxygen of the air, part also of its oxygen and hydrogen combine and form water, so that the residual matter has an increased proportion of carbon, and its composition is thus totally changed. These changes will be favoured by a high temperature: they are those, therefore, probably that take place in decoction, and impair or destroy the powers of the vegetable substance; though it is also possible, that chemical changes may arise from the re-action of the elements of the vegetable matter itself, independent of any action of the air.

From these observations, it is evident that decoction can seldom be a proper form for the administration of medicines. The pungency and aromatic flavour, on which part of their virtues depend, and which render them at least more grateful, must always be impaired or lost, and their more important virtues must often be injured. It is accordingly a form which is not now often applied to active remedies.

Decoctions, like infusions, are extemporaneous prescriptions. They cannot be kept ready prepared, as in a few days they become turbid, and

run into the acetous fermentation. They can be prepared, however, sooner than infusions; the boiling not requiring to be continued in general for more than ten or fifteen minutes. While the boiling continues, the air ought to be excluded by covering the vessel; and it ought not to be continued long. The method therefore often followed, of boiling down a considerable quantity of water on a vegetable, is generally improper. The liquor ought to be strained while hot, as, on cooling, a portion of the dissolved matter is frequently deposited, which is as active as that which remains dissolved, and this precipitate ought to be mingled with the liquid by agitation, when the dose is to be taken.

Decoctum Althææ Officinalis. Decoction of Althæa. Ed.

"Take of Dried Althæa Root, bruised, four ounces; Rasins, freed from their seeds, two ounces; Water, seven pounds. Boil to five pounds, put aside the strained liquor until the impurities have subsided, and pour off the clear liquor."

The gummy part of vegetables is less injured by decoction than any other. In this decoction, therefore, all the powers of the althæa root are obtained, and the liquor is concentrated by the evaporation. It is under this form that it is used as a demulcent, the decoction being taken to the extent of two or three pounds in the day, in nephritic complaints, in ardor urinæ, and sometimes in catarrh.

Decoctum Anthemidis Nobilis. Decoction of Chamomile. Ed.

"Take of the Dried Flowers of Chamomile, one ounce; Caraway Seeds bruised, half an ounce; Water, five pounds. Boil for a quarter of an hour, and strain."

Decoctum Chamæmeli Compositum. Compound Decoction of Chamomile. Dub.

"Take of Chamomile Flowers dried, half an ounce; Sweet Fennel Seeds, two drachms; Water, one pint. Boil a little, and strain."

These decoctions are used as an enema, and as a fomentation. When applied to the former purpose, the effect is to be ascribed principally to the water; in the second, the vegetables are not more useful, except as retaining longer the heat and moisture when applied to a part, and rendering its application more convenient. The decoction of the Dublin Pharmacopœia is rendered more active as an enema, by dissolving in ten ounces of it an ounce of manna, and half an ounce of sulphate of magnesia, adding an ounce of olive oil. It then forms what is named Enema Catharticum. When to this are added two drachms of tincture of assafœtida, it forms the preparation of the same Pharmacopœia named Enema Fœtidum.

Decoctum Cinchonæ Lancifoliæ. Decoction of Peruvian Bark. Ed.

"Take of Lance-leaved Bark bruised, one ounce; Water, one pound and a half. Boil for ten minutes in a covered vessel, and strain the liquor while hot."

Decoctum Cinchonæ. Decoction of Peruvian Bark. Lond.

"Take of Lance-leaved Cinchona Bark bruised, an ounce; Water, a pint. Boil for ten minutes in a vessel lightly closed, and strain the liquor while warm."

Decoctum Corticis Cinchonæ. Decoction of Peruvian Bark. Dub.

"Take of Peruvian Bark in course powder, an ounce; Water, a pint. Boil for ten minutes in a vessel nearly close, and strain the liquor while warm through linen."

The resino-extractive matter of Peruvian bark appears to be decomposed by decoction; hence the reason of the directions given in the Pharmacopœia under this preparation,—the boiling not being continued longer than ten minutes, as in this time the active matter, it is supposed, will be as fully extracted as it would be by longer boiling, and the decoction being performed in a covered vessel to exclude as much as possible the access of the air, to the chemical agency of which the change in the extractive matter has been supposed owing. The liquor is ordered to be strained while hot, as it holds dissolved a larger portion of the resinous matter than it can retain in solution when cold. Hence, after having been strained, it becomes turbid as it cools, depositing a reddish precipitate. This is its active matter, and ought to be mixed with it by agitation when the dose is to be taken. The addition of a little acid causes it to remain dissolved, and where this can be prescribed with propriety it may be employed.

Decoction of bark is used in those cases which require the free administration of the remedy, but in which in substance it sits uneasy on the stomach. The dose is two or three ounces, taken as often as the stomach will receive it; but it is scarcely sufficiently active to produce any of the more important effects of Peruvian bark.

Decoctum Daphnes Mezerei. Decoction of Mezereon. Ed.

"Take of the Bark of the Root of Mezereon, two drachms; of Liquorice Root bruised, half an ounce; Water, three pounds. Boil with a gentle heat to two pounds, and strain."

A compound decoction, prepared from guaiac wood, sarsaparilla, sassafras, mezereon, and liquorice, had been highly celebrated, under the name of Lisbon Diet Drink, for its efficacy in the treatment of symptoms connected with syphilis, particularly thickening of the ligaments, affections of the bones and periosteum, and obstinate ulceration. Dr. Russel, from a series of experiments, concluded, that the mezereon is the ingredient on which its activity depends; and this decoction, in which the liquorice serves to cover the pungency of the mezereon, has been substituted for the more complicated composition. It is used in the same cases; sometimes also in cutaneous affections, particularly lepra, and in chronic rheumatism. According to Mr. Pearson's experience of it, it has little efficacy in removing the syphilitic symptoms for which it is usually prescribed. It is not, however, an inactive preparation: its dose is from four to six ounces twice or thrice a-day. And in a large dose it is liable to excite nausea.

Decoctum Geoffrææ Inermis. Decoction of Cabbage-Tree Bark. Ed.

"Take of Cabbage-Tree Bark in powder, one ounce; Water, two pounds. Boil with a gentle heat to one pound, and strain."

This decoction is the form under which this medicine has been usually administered, the bark in substance being too violent in its operation. In the West India Islands, the decoction has been used as a very effectual remedy in worms, especially the lumbrici. The dose given is two ounces to an adult; if this occasion nausea, griping, or tenesmus, which it sometimes does, especially, it is affirmed, if cold water is drunk freely during its operation, these symptoms, are relieved by a dose of castor oil. In this country it has been much employed.

Decoctum Guaiaci Compositum. Compound Decoction of Guaiac. Ed.

"Take of Guaiac Wood Shavings, three ounces; Raisins, two ounces;

Sassafras Root cut, Liquorice Root, bruised, of each one ounce ; Water, ten pounds. Boil the water with the guaiac wood and raisins, on a gentle fire, to five pounds, adding the roots towards the end of the boiling, then strain."

This decoction derives its virtues principally from the guaiac. It acts as a diaphoretic, and has been used in cútaneous diseases, and in chronic rheumatism, taken in the quantity of a pound twice or thriee a-day. It has also been employed in the treatment of obstinate venereal symptoms, especially as an auxiliary to mercury.

Decoctum Hordei Distichi. Decoction of Barley. Ed.

"Take of Pearl Barley, two ounces ; Boiling Water, five pounds. First wash off with cold water the flour adhering to the barley ; then boil the barley for a short time with about half a pound of water, to extract the colouring matter. This being rejected, put the barley thus purified into five pounds of boiling water. Boil this to one half, and strain."

Decoctum Hordei. Decoction of Barley. Lond.

"Take of the Seeds of Barley, two ounces ; Water, four pints and a half. First wash off the impurities adhering to the barley in cold water, then pouring on half a pint of water, boil the seeds a little ; this water being rejected, pour on the remaining water previously heated ; then boil to two pints, and strain."

Decoctum Hordei. Decoction of Barley. Dub.

"Take of Pearl Barley, two ounces. Having first cleansed the barley with cold water, boil it in about half a pint of water for a little. The liquor being rejected, put the barley into five pints of boiling water ; then boil until the half of the water has been evaporated, and strain."

This decoction is never prepared in the shops. It is however, very extensively used as a diluent in febrile diseases ; and as it is of some importance that it should be grateful, it has been judged proper to give directions how it may be best prepared.

Decoctum Hordei Compositum. Compound Decoction of Barley. Lond.

"Take of Decoction of Barley, two pints ; Figs cut, two ounces ; Liquorice Root cut and bruised, half an ounce ; Raisins freed from the seeds, two ounces ; Water, a pint. Boil to two pints, and strain."

Decoctum Hordei Compositum. Compound Decoction of Barley. Dub.

"Take of Decoction of Barley, four pints; Raisins freed from the seeds, Figs cut, of each two ounces ; Liquorice cut and bruised, half an ounce. During the boiling, add first the raisins, then the figs, and lastly the liquorice, a little before the end of the boiling, which will be complete when about two pints of the liquor remain."

The additions in these compound decoctions can communicate little efficacy, and probably render the liquor rather cloying to the taste and stomach.

Decoctum Lichenis Islandici. Decoction of Iceland Liverwort. Ed.

"Take of Iceland Liverwort, an ounce ; Water, two pounds ; boil down to sixteen ounces, and strain."

Decoctum Lichenis. Decoction of Liverwort. Lond.

"Take of Liverwort, one ounce ; Water, a pint and a half ; boil down to a pint, and strain."

Decoctum Lichenis Islandici. Decoction of Iceland Liverwort. Dub.

"Take of Iceland Liverwort, half an ounce; Boiling Water, a pint. Digest for two hours in a close vessel; boil for a quarter of an hour, and strain the liquor while warm."

The fecula or mucilage of the lichen is extracted by water by boiling, and it is under this form of decoction that it has been employed as a demulcent, and a mild nutritious substance easy of digestion. It may be rendered more grateful by removing the bitter matter of the lichen, by previous maceration.

DECOCTUM POLYGALÆ SENEGÆ. Decoction of Seneka. Ed.

"Take of Seneka Root, one ounce; Water, two pounds. Boil to sixteen ounces, and strain."

DECOCTUM SENEGÆ. Decoction of Seneka. Lond.

"Take of Seneka Root, an ounce; Water, two pints. Boil to a pint, and strain."

Under the form of decoction, seneka has been employed as an expectorant in pneumonic affections, attended with accumulation of mucus in the bronchiæ, and as a diaphoretic in chronic rheumatism. The dose is two or three ounces three or four times a-day.

DECOCTUM QUERCUS ROBORIS. Decoction of Oak Bark. Ed.

"Take of Oak Bark bruised, an ounce; Water, two pounds and a half. Boil down to sixteen ounces, and strain."

DECOCTUM QUERCUS. Decoction of Oak Bark. Lond.

"Take of Oak Bark, an ounce; Water, two pints. Boil down to a pint, and strain."

The astringency of the oak bark is extracted by boiling in water; and the decoction is the form under which it is used locally as a styptic in hæmorrhoids, prolapsus ani, leucorrhœa, and profuse menorrhagia.

DECOCTUM SMILACIS SARSAPARILLÆ. Decoction of Sarsaparilla. Ed.

"Take of Sarsaparilla Root cut, six ounces; Water, eight pounds. Digest for two hours, in a temperature of about 195°, then take out the root and bruise it; put it again into the liquor, and boil it with a gentle fire to four pounds; then express it, and strain."

DECOCTUM SARSAPARILLÆ. Decoction of Sarsaparilla. Lond.

"Take of Sarsaparilla Root cut, four ounces; Boiling Water, four pints. Macerate for four hours in a vessel lightly closed, nigh the fire, then cut and bruise the sarsaparilla; return it bruised into the liquor, and again macerate in a similar manner for two hours; lastly, boil to two pints, and strain."

DECOCTUM SARSAPARILLÆ. Decoction of Sarsaparilla. Dub.

"Take of Sarsaparilla Root cut, an ounce and a half; Boiling Water, two pints. Digest for two hours in a medium heat, (between 100 and 200°), then take out the Sarsaparilla and bruise it; return it bruised into the liquor, and again digest for two hours; lastly, let the liquor, after the half of it has been consumed by boiling, be expressed, and strained through linen."

The fecula, which is the principle in which the power of sarsaparilla resides, is not easily extracted merely by boiling the root. This is the reason of the particular directions to digest the root first, and then bruise it: it is thus softened, and yields its soluble matter more readily in the sub-

sequent boiling. This decoction is the form under which sarsaparilla is always given, its dose being from a pint to a quart in the course of the day. It has been used in venereal cases, either to promote the action of mercury, or to remove symptoms which have remained after a long continued mercurial course. Dr. Fordyce celebrated its efficacy in very high terms in giving relief in nocturnal pains, removing eruptions, and as being the best restorative in the emaciations and debility remaining after the long continued use of mercury. It efficacy has however probably been overrated; the opinion is perhaps more just which regards it only as belonging to the nutrientia, or as a demulcent; and the benefit sometimes derived during its use has as frequently arisen from the exhibition of mercury too long continued having been suspended, as from any action of the sarsaparilla itself. The decoction has been used with considerable advantage as a demulcent in dysuria, and in morbid irritability of the bladder, occasioning incontinence of urine.

Decoctum Ulmi Campestris. Decoction of Elm. Ed.

"Take of the Fresh Bark of the Elm bruised, four ounces; of Water, five pounds. Boil down to two pounds and a half, and then strain."

Decoctum Ulmi. Decoction of Elm. Lond.

"Take of the Fresh Bark of the Elm bruised, four ounces; Water, four pints. Boil to two pints, and strain."

Decoctum Ulmi. Decoction of Elm. Dub.

"Take of the interior Fresh Bark of the Elm bruised, two ounces; Water, two pints. Boil to a pint, and strain."

This decoction has been highly praised by some practitioners in certain cutaneous diseases, and by others again it has been as much depreciated. The decoction is the form in which it is usually given, the dose being from four to six ounces, taken twice or thrice a-day.

A few decoctions, peculiar to the London and Dublin Pharmacopœias, remain to be noticed.

Decoctum Aloes Compositum. Compound decoction of Aloes. Lond.

"Take of Extract of Liquorice, half an ounce; Sub-carbonate of Potash, two scruples; Extract of Aloes, Myrrh in powder, Saffron, of each one drachm; Water, a pint. Boil down to twelve fluidounces, and strain; then add of Compound Tincture of Cardamoms four fluidounces."

The gum-resinous substances in this decoction are retained in solution, partly by the solvent power of the water, and partly by the action of the alkali; and by the addition of the spiritous tincture, any spontaneous decomposition will be more effectually prevented. The composition is newly introduced into the Pharmacopœia, and is said to be analogous to one formerly in use, under the name of Baume de Vie. It is one which it might be supposed must be very nauseous, but it is said to be not ungrateful, and to form a good stimulating aperient. It is given in the dose of two ounces.

Decoctum Cydoniæ. Decoction of Quince Seeds. Lond.

"Take of Quince Seeds, two drachms; Water, a pint. Boil with a gentle heat for ten minutes, then strain.

Quince seeds abound with mucilage, which is extracted by boiling in wa-

ter. It is liable to spontaneous decomposition, and having no peculiar advantage, is little used.

Decoctum Dulcamaræ. Decoction of Woody Nightshade. Lond.
"Take of the Stalks of Woody Nightshade cut, one ounce; Water, a pint and a half. Boil to a pint, and strain."

Under this form the woody nightshade may be employed; but there seems no propriety in giving a formula for its preparation, more than any other vegetable substance, which may be given under the same or any similar form.

Decoctum Malvæ Compositum. Compound decoction of Mallow. Lond.
"Take of Mallow dried, an ounce; Chamomile Flowers dried, half an ounce; Water, a-pint. Boil them for a quarter of an hour, and strain."

This is designed for the same purpose as the decoction of chamomile, that of serving as a vehicle for fomentations and enemas; and the same observation applies to it.

Decoctum Papaveris. Decoction of Poppy. Lond.
"Take of the Capsules of the White Poppy cut, four ounces: Water, four pints. Boil for a quarter of an hour, and strain."

The decoction of the capsules of the poppy has been frequently used as an anodyne fomentation, and is now, with propriety, introduced as an officinal preparation.

Decoctum Sarsaparillæ Compositum. Compound Decoction of Sarsaparilla. Lond.
"Take of the Simple Decoction of Sarsaparilla boiling, four pints; Sassafras Wood cut, Raspings of Guaiac Wood, Liquorice Root bruised, of each one ounce; Mazereon, three drachms. Boil for a quarter of an hour, and strain."

Decoctum Sarsaparillæ Compositum. Compound Decoction of Sarsaparilla. Dub.
"Take of Sarsaparilla Root cut and bruised, an ounce and a half; Shavings of Guaiac Wood, Bark of Sassafras Root, Liquorice bruised, of each two drachms; Bark of Mezereon Root, a drachm; Boiling Water, three pints,—Digest the sarsaparilla, guaiac, and sassafras, in water at a heat between 100° and 200° for six hours; then boil until the half of the water is evaporated, adding towards the end of the boiling the liquorice with the mezereon; lastly, strain."

This is nearly the same composition as the Lisbon Diet Drink, celebrated, as has been already remarked, in the treatment of secondary venereal affections, or symptoms appearing during a protracted mercurial course. The efficacy of the preparation has been supposed to depend principally on the mezereon; the other substances may, however, add something to its power, and it is perhaps preferable, as a general rule, to adhere to the original composition of remedies of this kind, the efficacy of which is in some measure specific, where it appears otherwise unexceptionable. Its dose is four or six ounces, three times a-day.

Decoctum Veratri. Decoction of White Hellebore. Lond.
"Take of White Hellebore Root beat, an ounce; Water, two pints;

Rectified Spirit, two fluidounces. Boil the white hellebore root with the water down to a pint, and strain; when cold, add the spirit."

This decoction is employed as an external application in some cutaneous diseases, principally in psora. It is a much less unpleasant application than the sulphur ointment, and is occasionally successful. It must, however, be used with caution, as it is very acrid and stimulant.

Decoctum Digitalis. Decoction of Foxglove. Dub.

"Take of the Leaves of Foxglove dried, one drachm, Water, as much as may be sufficient to afford eight ounces of strained liquor. Place the vessel on a gentle fire, and remove it when the liquor begins to boil; then digest for a quarter of an hour, and strain."

Water extracts sufficiently the active matter of the leaves of Foxglove by infusion, and there is therefore no necessity for boiling it upon them. The decoction in this preparation is, however, so slight, that it cannot alter the powers of the medicine, and it may be regarded as analogous to the infusion of the other Pharmacopœias. The proportions too are the same, and it may therefore be given in the same dose.

CHAP. X.

SYRUPI.—SYRUPS.

Syrups are saturated solutions of sugar in water, in watery infusions, or in vegetable juices. They are seldom active medicines; and are more commonly employed to render others agreeable, and in Pharmacy to communicate peculiar forms.

The proportion of sugar in syrups is generally two parts to one of the fluids; if it is more than this, the solution is disposed to crystallize; if less, it is liable to ferment, and become acescent. Refined sugar ought always to be employed. It is to be melted in the liquid by a gentle heat, and any impurities which collect on its surface when boiling are to be removed. The syrup ought to be kept in a cool place, to prevent the fermentation, which is favoured by a high temperature. The London College order them to be kept at a temperature not higher than 55°. The Dublin College give the general formula with regard to the preparation of all the syrups which they prescribe, that "twenty-nine ounces of refined sugar in powder, and a pint of the prescribed liquor, are to be digested with a moderate heat, in a close vessel, stirring frequently, until the sugar, which must be gradually added, is dissolved; the liquor is to be put aside for twenty-four hours, the scum removed, and the syrup poured off from any impurities."

Syrupus Aceti. Syrup of Vinegar. Ed.

"Take of Vinegar, five parts; Refined Sugar, seven parts. Boil so as to form a syrup."

This is a very simple syrup a little acidulated, and may be given mixed with barley-water, or demulcents of that nature, in febrile or inflammato-

ry diseases. As it is sufficiently pleasant as an acid, it may be mixed with all those medicines in which the acid does not effect any chemical change.

Syrupus Althææ Officinalis. Syrup of Althæa. Ed.

"Take of Fresh Althæa Root cut, one part; Water, ten parts; Refined Sugar, four parts. Boil the water with the root to one half, and expressing it strongly, strain. Put aside the strained liquor, that the impurities may subside, and to the purified liquor, add the sugar. Boil it so as to form a syrup."

Syrupus Althææ. Syrup of Althæa. Lond.

"Take of Fresh Althæa Root bruised, half a pound; Refined Sugar, two pounds; Water, four pints. Boil the water with the root to one half, and express the cold liquor. Put it aside for twenty-four hours, that the impurities may subside; then pour off the liquor, and having added the sugar, boil to a proper consistence."

The water dissolving the mucilage of the althæa, less than the usual proportion of sugar is required to give it the consistence of a syrup. This mucilage is supposed to give the syrup some demulcent power; but this must be very trivial, and it renders it more liable to spontaneous decomposition.

Syrupus Amomi Zingiberis. Syrup of Ginger. Ed.

"Take of the Root of Ginger beat, six drachms; Boiling Water, one pound: Refined Sugar, twenty-two ounces. Marcerate the root with the water, in a close vessel, for twenty-four hours, then add the sugar to the strained liquor, and dissolve by a gentle heat."

Syrupus Zingiberis. Syrup of Ginger. Lond.

"Take of Ginger Root cut, two ounces; Boiling Water, a pint; Refined Sugar, two pounds. Macerate the ginger in the water for four hours, and strain; then add the sugar, in the manner ordered with regard to simple syrup."

Syrupus Zingiberis. Syrup of Ginger. Dub.

"Take of Ginger Root bruised, four ounces; Boiling Water, three pints. Macerate for twenty-four hours; then to the strained liquor add the sugar, and form a syrup."

The infusion is impregnated with the flavour and pungency of the ginger, which render it sufficiently grateful, and it affords a cheap aromatic syrup.

Syrupus Cassiæ Sennæ. Syrup of Senna. Ed.

"Take of Senna Leaves, two ounces; Boiling Water, a pound and a half; Empyreumatic Syrup, eight ounces. Macerate the leaves in the water, in a lightly covered vessel, for four hours, and strain; add the syrup, and boil with a gentle heat, to the thickness of the empyreumatic syrup."

Syrupus Sennæ. Syrup of Senna. Lond.

"Take of Senna Leaves, two ounces; Bruised Fennel Seeds, an ounce; Manna, three ounces; Refined Sugar, one pound; Boiling Water, one pint. Macerate the senna leaves and the fennel seeds in the water, with a gentle heat, for an hour; strain the liquor; mix with this the manna and sugar, and boil to a proper consistence."

Syrupus Sennæ. Syrup of Senna. Dub.

"Take of Manna, Refined Sugar, of each a pound; Senna Leaves, half

an ounce; Boiling Water, a pint. Marcerate the senna in the water in a close vessel for twelve hours; then mix with the strained liquor the manna and sugar, so that they may dissolve."

This is designed as a purgative syrup for children. The proportion of saccharine matter is too large, and renders the syrup as thick as honey. The infusion of senna, sweetened with sugar or manna, which is in common use, being of extemporaneous preparation, is preferable.

Syrupus Citri Aurantii. Syrup of Orange Peel. Ed.

"Take of the Fresh Outer Rhind of the Orange, three ounces; Boiling Water, one pound and a half; Refined Sugar, three pounds. Macerate the rhind with the water for twelve hours in a closed vessel, then strain the liquor, and added the sugar to be dissolved by a gentle heat."

Syrupus Aurantiorum. Syrup of Orange-Peel. Lond.

"Take of the Fresh Rhind of the Orange, two ounces; Boiling Water, a pint: Refined Sugar, three pounds. Macerate the rhind in the water for twelve hours, in a vessel lightly closed; then pour off the liquor, and add the sugar to it."

Syrupus Aurantii. Syrup of Orange-Peel. Dub.

"Take of the Fresh Rhind of the Seville Orange, eight ounces; Boiling Water, six pints. Macerate for twelve hours in a close vessel; then in the strained liquor dissolve sugar to form a syrup."

This syrup, like that of Ginger, is used on account of its grateful aromatic flavour.

Syrupus Citri Medicæ. Syrup of Lemon. Ed.

"Take of the juice of Lemons strained, after the impurities have subsided, three parts; Refined Sugar, five parts; dissolve the sugar so as to form a syrup."

Syrupus Limonum. Syrup of Lemons. Lond.

"Take of Lemon Juice strained, a pint; Refined Sugar, two pounds. Dissolve the sugar in the lemon juice in the manner ordered for preparing simple syrup."

Syrupus Limonis. Syrup of Lemon. Dub.

"Take of Strained Lemon Juice, one pint; Refined Sugar, two pounds. Dissolve the sugar in the lemon juice, in the manner ordered for preparing simple syrup."

This is a pleasant syrup, used to sweeten and acidulate mixtures, especially those of the mucilaginous kind: there are others, into the composition of which it cannot properly enter, from the chemical agency of the acid.

Syrupus Colchici Autumnalis. Syrup of Colchicum. Ed.

"Take of the Fresh Root of Colchicum, cut into small pieces, one ounce; Vinegar, sixteen ounces; Refined Sugar, twenty-six ounces. Macerate the root in the acid for two days, shaking the vessel occasionally; then expressing it gently, strain it; to the strained liquor add the sugar, and boil a little, so as to form a syrup."

Colchicum has been used under this form as a diuretic in dropsy, the dose being from half an ounce to an ounce.

Syrupus Dianthi Caryophilli. Syrup of Clove July-Flower. Ed.

"Take of the Fresh Petals of the Clove July-Flower freed from the

heels, one part; Boiling Water, four parts; Refined Sugar, seven parts. Macerate the petals in the water for twelve hours; then to the strained liquor add the sugar which dissolve with a gentle heat."

SYRUPUS CARYOPHILLI RUBRI. Syrup of Clove July-Flower. Dub.

"Take of the fresh Petals of the Clove July-Flower, freed from the heels, two pounds; Boiling Water, six pints. Macerate for twelve hours in a glass vessel, dissolve the sugar in the strained liquor, so as to form a syrup."

This syrup derives from the flowers a rich red colour, and an agreeable flavour, and from these qualities is frequently used in mixtures.

SYRUPUS PAPAVERIS SOMNIFERI. Syrup of White Poppy. Ed.

"Take of the Dried Capsules of the White Poppy, freed from the seeds, one part; Boiling Water, fifteen parts; Refined Sugar, two parts. Macerate the capsules cut in the water for twelve hours; then boil until a third part only of the liquor remain; and pressing it strongly strain; lastly, the sugar being added, boil so as to form a syrup."

SYRUPUS PAPAVERIS. Syrup of Poppy. Lond.

"Take of the Capsules of the Poppy, dried and bruised, the seeds being removed, fourteen ounces; Refined Sugar, two pounds; Boiling Water, two gallons and a half. Macerate the capsules in water for twenty-four hours: then boil down the liquor in a water-bath to a gallon, and express it strongly; boil it again to two pints, and strain it while hot. Put it aside for twelve hours, that the impurities may subside; then boil down the purified liquor to a pint, and add the sugar as ordered for the preparation of simple syrup."

SYRUPUS PAPAVERIS ALBI. Syrup of White Poppy. Dub.

"Take of the Capsules of the White Poppy, gathered before they are ripe, and dried, (the seeds being removed,) a pound; Boiling Water, three pints. Cut and bruise the capsules; then pour on them the water, and macerate for twelve hours; express the liquor, and evaporate it by a moderate heat to a pint; strain it through a thin linen cloth, and put it aside for six hours, that the impurities may subside; lastly, having freed the liquor from the impurities, add sugar so as to form a syrup."

The active matter of the capsule of the poppy is extracted by water by decoction, and, by boiling down the liquor, it is obtained in a more concentrated state, whether with any diminution of its power from the continued decoction has not been ascertained. The syrup has a considerable degree of narcotic power; and the taste being agreeable, and the dose easily regulated, it is more convenient than any preparation of opium for exhibition to children. The medium dose is about a drachm to a child a year old. From the supposition that it is uncertain in its strength, it has been proposed to substitute for it a composition of simple syrup and tincture of opium; but it is not altogether certain that the operation of this is exactly the same; and there is some risk, that from spontaneous decomposition, part of the active matter of the opium may be precipitated gradually, which would give rise to more uncertainty, and might sometimes occasion dangerous consequences. The quantity of syrup prepared from a given weight of the capsules is considerably larger, according to the formula of the Edinburgh Pharmacopœia, than those of the others. Whether it is proportionally weaker remains to be ascertained.

SYRUPUS ROSÆ CENTIFOLIÆ. Syrup of Damask or Pale Rose. Ed.

"Take of the Fresh Petals of the Damask Rose, one part; Boiling Water, four parts; Refined Sugar, three parts. Macerate the petals in water for twelve hours; then to the strained liquor add the sugar, and boil so as to form a syrup."

Syrupus Rosæ. Syrup of Rose. Lond.

"Take of the Dried Petals of the Damask Rose, seven ounces; Refined Sugar, six pounds: Boiling Water, four pints. Macerate the petals of the rose in water for twelve hours, and strain. Evaporate the strained liquor by a water-bath, to two pints and a half; then add the sugar as ordered for the preparation of simple syrup."

The agreeable flavour of the rose is lost in this syrup; but it has a weak purgative power, and is sometimes given to infants in a dose of two or three tea-spoonfuls.

Syrupus Rosæ Gallicæ. Syrup of Red Rose. Ed.

"Take of the Dried Petals of the Red Rose, one part; Boiling Water, nine parts; Refined Sugar, ten parts. Macerate the petals in water for twelve hours; then boil them a little, and strain; to the strained liquor add the sugar, and again boil, so as to form a syrup."

Water, by infusion, extracts the slight astringency and the colour of the red rose; the astringency has been supposed to be such as to counteract the laxative quality of the sugar, and hence it is usually this syrup that enters into the composition of astringent mixtures.

Syrupus Scillæ Maratimæ. Syrup of Squill. Ed.

"Take of the Vinegar of Squill, four parts; Refined Sugar in powder, seven parts. Dissolve the sugar with a gentle heat, so as to form a syrup."

This is a syrup of considerable power, the active matter of squill being dissolved by vinegar without much change, and being little injured in forming it into a syrup. It is a form under which squill is often prescribed as an expectorant; it is given in a dose of one or two drachms, and is often added to combinations of expectorant remedies. It is also given to children as an emetic, especially in pertussis, the operation of it being sometimes promoted by the addition of a little ipecacuan or antimonial wine.

Syrupus Simplex. Simple Syrup. Ed.

"Take of Refined Sugar, fifteen parts; Water, eight parts. Dissolve the sugar with a gentle heat, and boil a little so as to form a syrup."

Syrupus Simplex. Simple Syrup. Lond.

"Take of Refined Sugar, two pounds and a half; Water, a pint. Dissolve the sugar in the water in a water-bath, put aside for twenty-four hours; then remove the scum, and pour off the clear liquor from any impurities."

This solution of sugar is used merely to communicate sweetness of taste, or for the pharmaceutical purposes to which syrups are applied.

Syrupus Toluiferæ Balsami. Syrup of Tolu Balsam. Ed.

"Take of Common Syrup, two pounds; Tincture of Tolu Balsam, one ounce. With the syrup newly prepared, and removed from the fire, when it has nearly cooled, mix the tincture gradually, continually stirring it."

Syrupus Tolutanus. Tolu Syrup. Lond.

"Take of Balsam of Tolu, one ounce; Boiling Water, a pint; Refined Sugar, two pounds. Boil the balsam in the water for half an hour in

a close vessel, stirring frequently, and strain the liquor when cold, then add the sugar as directed for preparing simple syrup."

The formula of the Edinburgh Pharmacopœia gives an economical mode of preparing this syrup; but the old method, retained in the London Pharmacopœia, affords a more grateful composition, the syrup being impregnated with the odour of the balsam, without its resinous matter being diffused through it, which, as prepared by the other mode, renders it white and turbid. The syrup is used merely on account of its flavour, and to many this is rather disagreeable. On the supposition of tolu balsam being an expectorant, it sometimes enters into the composition of mixtures used in catarrh.

Syrupus Violæ Odoratæ. Syrup of Violet.

"Take of the Fresh Flowers of the Sweet-scented Violet, two parts: Boiling Water, eight parts; Refined Sugar, fifteen parts. Macerate the flowers in water for twenty-four hours in a covered glass or earthen vessel: then strain, without expression, and to the strained liquor add the sugar so as to form a syrup."

Syrupus Violæ. Syrup of Violet. Dub.

"Take of the fresh Petals of the violet, two pounds; Boiling Water, five pints. Macerate for twenty-four hours, then strain the liquor through fine linen without expression, add lastly sugar so as to form a syrup."

This syrup has a fine blue colour, which is, however, lost on keeping. It is a very gentle laxative, and as such is given to infants in a dose of one or two tea-spoonfuls.

It remains to notice those few syrups which have exclusively a place in the London or Dublin Pharmacopœias.

Syrupus Croci. Syrup of Saffron. Lond.

"Take of Saffron, an ounce; Boiling Water, a pint; Refined Sugar, two pounds and a half. Macerate the saffron in the water for twelve hours, in a vessel lightly closed; then strain the liquor, and add the sugar to it."

This syrup is employed in mixtures merely on account of its colour.

Syrupus Mori. Syrup of Mulberry. Lond.

"Take of Mulberry Juice strained, a pint; Refined Sugar, two pounds. Dissolve the sugar in the juice in the manner directed with regard to simple syrup."

The syrups of several acidulous fruits had formerly a place in the London Pharmacopœia. This is retained as one of the most grateful.

Syrupus Rhamni. Syrup of Buckthorn. Lond.

"Take of the Fresh Juice of Buckthorn Berries, four pints; Ginger Root cut, Pimento Berries bruised, of each half an ounce; Refined Sugar, three pounds and a half. Put aside the juice for three days, that the impurities may subside, and strain. To a pint of the purified juice, add the ginger and pimento; macerate with a gentle heat for four hours, and strain. Boil down the remaining quantity to a pint and a half, mix the liquids, then add the sugar, as ordered for preparing simple syrup."

The juice of the buckthorn is best preserved by being made into a syrup, and it is under this form that it has been usd as a cathartic, the dose to an

adult being an ounce, or an ounce and a half. Its operation, however, is unpleasant, and the preparation has nothing to recommend it. In this composition, the ginger and Jamaica pepper communicate a pleasant flavour, and may obviate the griping it is liable to produce.

Syrupus Rhoeados. Syrup of Red Poppy. Lond.

"Take of the Recent Petals of the Red Poppy, one pound; Boiling Water, a pint and two fluidounces; Refined Sugar, two pounds and a half. To the water heated by a water-bath, add the petals of the red poppy, gradually stirring them occasionally; then having removed the vessel, macerate for twelve hours: press out the liquor, and put it aside, that the impurities may subside; lastly, add the sugar in the manner directed with regard to simple syrup."

Syrupus Papaveris Erratici. Syrup of Wild Poppy. Dub.

"Take of the Fresh Petals of the Wild Poppy, a pound; Boiling Water, twenty ounces. Add the flowers gradually to the boiling water; then removing the vessel from the fire, macerate with a lower heat for twelve hours; express the liquor, and put it aside that the impurities may subside; lastly, add sugar and form a syrup."

This syrup is valued only on account of the fine red colour which it receives from the petals of the flower.

Syrupus Alii. Syrup of Garlic. Dub.

"Take of Garlic Root cut, one pound; of Boiling Water, two pints. Macerate the garlic in the water for twelve hours in a covered vessel, and then add sugar to the strained liquor, so as to form a syrup."

Garlic has been employed as an expectorant in some forms of catarrh and dyspnœa, under the form of syrup. It has perhaps, however, no such power as to entitle it to a place as an officinal preparation.

Syrupus Opii. Syrup of Opium. Dub.

"Take of the Watery Extract of Opium, eighteen grains; Boiling Water, eight ounces. Macerate them together until the opium be dissolved; then add sugar, so as to form a syrup."

This is designed as a substitute for the syrup of poppy. Tincture of opium, added to simple syrup, has sometimes been used for this purpose; but on keeping, part of the active resinous matter of the opium is liable to separate and subside, and from being diffused in the small portion of syrup at the bottom of the bottle in which it is kept, may be productive of dangerous consequences. The watery extract of opium, not the opium in substance, being dissolved in this syrup, it may not be liable to this objection. It is not altogether certain, however, whether, in the preparation of the watery extract, (to be afterwards noticed), the narcotic power of the opium is not impaired, and, therefore, whether this preparation from it will be always of uniform strength. An ounce of the syrup contains about one grain of the watery extract; its strength, therefore, will be nearly the same as the medium strength of the syrup of poppy.

CHAP. XI.

MELLITA.—MEDICATED HONEYS.

Honey has been employed instead of saccharine matter in some pharmaceutical preparations. Combined with vinegar, either alone or with the impregnation of the active matter of vegetables, the kind of composition named Oxymel is formed. Combined merely with infusions of vegetable substances, it forms what are more exclusively named Medicated Honeys.

Mel Despumatum. Clarified Honey. Ed. Lond. Dub.
"Liquefy honey in a water-bath, and remove the scum as it rises."

Honey, as it is expressed from the comb, is liable to contain wax and other impurities. When the honey is liquefied, these in a great measure separate and rise to the surface, so as to be easily removed. The honey thus purified is ordered in the other preparations into which it enters.

Mel Rosæ Gallicæ. Honey of Red Roses. Ed.
"Take of Red Rose Leaves dried, one ounce; Boiling Water, one pound; Clarified Honey, sixteen ounces. Macerate the petals in the water for six hours; then strain, add the honey, and finally boil down to a proper thickness."

Mel Rosæ. Honey of Rose. Lond.
"Take of the Dried Petals of the Red Rose, four ounces; Boiling water, three pints; Clarified Honey, five pints. Marcerate the petals in the water for six hours, then to the strained liquor add the honey, and boil in down in a water-bath to the proper consistence."

Mel Rosæ. Honey of Rose. Dub.
"Take of the Petals of the Red Rose not fully blown, freed from the heels and dried, four ounces; Boiling Water, three pints; Honey, five pounds. Macerate the petals in the water for six hours, mix the honey with the strained liquor, and boil down until it attain the consistence of syrup, removing the scum."

This prepartion is similar to the syrup of the red rose, and may be applied to the same purposes.

Mel Sub-Boratis Sodæ. Honey of Borax. Ed.
"Take of Sub-borate of Soda, in powder, one part; Clarified Honey, eight parts. Mix them."

Mel Boracis. Honey of Borax. Lond.
"Take of Sub-borate of Soda, in powder, a drachm; Clarified Honey, an ounce. Mix them."

In this composition, honey is useful, as giving the proper consistence. It is designed as an application in aphthous affections of the tongue and fauces, the borax giving a sense of coolness, and removing the foul crust.

Oxymel. Oxymel. Ed.
"Take of Clarified Honey, three parts; Weak Acetic acid, two parts. Boil down, in a glass vessel, on a slow fire, to a proper thickness."

Oxymel Simplex. Simple Oxymel. Lond.

"Take of Purified Honey, two pounds; Acetic Acid, a pint. Boil them in a glass vessel, on a slow fire, to the proper consistence."

Oxymel. Oxymel. Dub.

"Take of Honey, two pounds; Distilled Vinegar, a pint. Boil in a glass vessel, with a gentle heat, to the thickness of syrup, removing the scum."

This has long been in use as a remedy in catarrhal affections, and is also the basis of a cooling detergent gargle.

Besides these preparations with Honey, there are a few more belonging to the London and Dublin Pharmacopœias, which remain to be noticed.

Oxymel Scillæ. Oxymel of Squill. Lond.

"Take of Clarified Honey, three pounds; Vinegar of Squill, two pints. Boil in a glass vessel, over a slow fire, to a proper consistence."

Oxymel Scillæ. Oxymel of Squill. Dub.

"Take of Clarified Honey, three pounds: Vinegar of Squill, two pints. Boil down in a glass vessel, on a gentle fire, to the thickness of syrup."

Under this form squill has been employed principally as an expectorant. Its dose is one or two drachms.

Oxymel Colchici. Oxymel of Colchicum. Dub.

"Take of the Fresh Root of Colchicum cut into thin slices; one ounce. Distilled Vinegar, one pint; Clarified Honey, two pounds. Macerate the colchicum with the vinegar for two days, in a glass vessel; then strain the liquor pressed out strongly from the root, and add the honey. Lastly, boil the mixture, stirring it frequently with a wooden spoon, to the consistence of a syrup."

This is essentially the same with the syrup of colchicum already noticed; nor can it derive any advantage from honey being used in its preparation.

Oxymel Æruginis. Oxymel of Verdigrease. Dub.

"Take of Prepared Verdigrease, one ounce; Vinegar, seven ounces; Clarified Honey, fourteen ounces. Dissolve the verdigrease in the vinegar, and strain through linen, then add the honey, and boil down to a proper thickness."

Linimentum Æruginis. Liniment of Verdigrease. Lond.

"Take of Verdigrease in powder, an ounce; Vinegar, seven fluidounces; Clarified Honey, fourteen ounces. Dissolve the verdigrease in the vinegar, and strain through linen, then having added the honey, boil to a proper thickness."

Under this form, verdigrease has been applied as a stimulant and escharotic to foul ulcers, especially ulcerations of the mouth and tonsils connected with a venereal taint.

CHAP. XII.

VINA.—WINES.

Wine is capable, by infusion, of extracting several proximate principles of vegetable substances. From the alcohol it contains, it dissolves a portion of their resin, extract, and essential oil; its watery part dissolves their gum or mucilage; and being milder and more pleasant to the taste than diluted alcohol, it has been preferred as a solvent; hence Medicated Wines have long been in use.

It cannot be said, however, to be well adapted to this use. Wine, when not carefully excluded from the air, is apt to become acescent; and, when it holds vegetable matter in solution, is still more liable to suffer this change. This has been established by the researches of Parmentier; and he has shown that the greater number of medicated wines, if kept for any length of time, become medicated vinegars. This change may modify the powers of the dissolved matter; and in some cases, where the wine is taken in a considerable dose, must prove hurtful to the stomach, especially in dyspeptic affections. Accordingly, few of the medicated wines are now employed. The spontaneous decomposition to which they are liable, is sometimes attempted to be obviated by the addition of a little alcohol, but this is attended with imperfect success.

From the tartaric acid which wines contain, they are capable of acting chemically on some of the metals, and are better solvents of some metallic preparations than water or alcohol.

"Wines," according to the Edinburgh Pharmacopœia, "should be prepared in close vessels, and frequently agitated during their preparation."

Vinum Aloes Socotorinæ. Wine of Socotorine Aloes. Ed.

"Take of Socotorine Aloes, reduced to powder, one ounce; Lesser Cardamom Seeds, Ginger Root, of each bruised, one drachm; Spanish White-wine, two pounds. Digest for seven days, and strain."

Vinum Aloes. Wine of Aloes. Lond.

"Take of Aloes, eight ounces; Canella Bark, two ounces; Wine, six pints; Proof-spirit, two pints. Triturate the Aloes with white sand freed from impurities, into powder; rub the canella bark to powder, and upon these mixed pour the wine and spirit. Macerate for fourteen days, shaking occasionally, and strain."

Vinum Aloes. Wine of Aloes. Dub.

"Take of Socotorine Aloes, four ounces; Canella, an ounce; Spanish White-wine, three pints; Proof-spirit, one pint. Mix the aloes and canella separately reduced to powder, and pour on the wine mixed with the spirit. Digest for fourteen days, shaking the vessel frequently; lastly, strain the liquor."

The trituration with sand directed by the London College, is designed to facilitate the solution of the aloes, but is not very necessary. Aloes being soluble in wine, all its virtues are obtained in this solution, and from the presence of the resinous matter of the aloes, it is not liable to become acescent. It is a stimulating purgative which has long been in use under the name of Sacred Tincture. It produces its full effect in the dose of one

ounce. In a dose of one or two drachms, it is given to excite the action of the intestines and neighbouring organs, in dyspepsia, amenorrhœa, and similar affections.

VINUM GENTIANÆ COMPOSITUM. Compound of Gentian Wine. Ed.

"Take of Gentian Root, half an ounce; Lance-leaved Bark, one ounce; Orange-Peel dried, two drachms: White Canella Bark, one drachm; Diluted Alcohol, four ounces; Spanish White-wine, two pounds and a half. On the root and barks cut and bruised, pour first the diluted alcohol; and after twenty-four hours, add the wine. Then macerate for seven days, and strain."

This wine is designed as a stomachic; and has been regarded as preferable to the tincture, as being more mild and grateful, and therefore better for continued use; but from its tendency to become acescent, it is not adapted to administration in dyspepsia. Its dose is six drachms.

VINUM IPECACUANHÆ. Ipecacuan Wine. Ed.

"Take of Ipecacuan Root bruised, one part; Spanish White-wine, fifteen parts. Macerate for seven days, and strain through paper."

VINUM IPECACUANHÆ. Wine of Ipecacuan. Lond.

"Take of Root of Ipecacuan bruised, two ounces; Wine, two pints. Macerate for fourteen days, and strain."

VINUM IPECACUANHÆ. Wine of Ipecacuan. Dub.

"Take of Root of Ipecacuan bruised, two ounces; Spanish White-wine, two pints. Digest for seven days, then strain."

Wine extracts the active matter of Ipecacuan, and covers its taste and flavour, while it has the advantage of being less pungent than diluted alcohol. This wine is often used as an emetic, especially to children, to whom, from being not ungrateful, it can be given without difficulty. Its dose is one ounce to an adult, one drachm to a child a year old.

VINUM NICOTIANÆ TABACI. Tobacco Wine. Ed.

"Take of the Leaves of Tobacco, one part; Spanish White-wine, twelve parts. Macerate for seven days, and strain through paper."

Under this form, Tobacco has been used as a diuretic in dropsy. The dose is thirty drops, gradually increased to sixty or eighty twice a-day. It is liable, however to excite sickness in this large dose, and a smaller dose often fails in its diuretic effect.

VINUM OPII. Wine of Opium. Ed.

"Take of Opium, one ounce; Cinnamon Bark bruised, Cloves bruised, of each one drachm; White Spanish Wine, sixteen ounces. Macerate for seven days, and strain."

VINUM OPII. Wine of Opium. Lond.

"Take of Extract of Opium, an ounce; Cinnamon Bark bruised, Cloves bruised, each one drachm; Wine, a pint. Macerate for eight days, and strain."

Wine dissolves the active matter of opium, and has often been used as a menstruum. With the addition of aromatics, it formed the liquid laudanum of Sydenham, and was at one time an officinal preparation in the Pharmacopœias, though afterwards excluded, to give place to the tincture of opium. It is now restored by the London and Edinburgh Colleges, as it had continued in use, and is supposed to have some advantages over the tincture; and, from the addition of the aromatics in particular, to be less liable

to occasion nausea. It is nearly of the same strength. Vinegar impairs the narcotic power of opium; hence, if this medicated wine were liable to acescency, it might be regarded as an uncertain preparation, but the resino-extractive matter of the opium and the aromatics may perhaps counteract any spontaneous decomposition. The Wine of opium has also been recommended strongly by Mr. Ware as the best form under which opium can be used as a local application in chronic ophthalmia, two or three drops of it being introduced under the eye-lids.

Vinum Rhei. Rhubarb Wine. Ed.

"Take of the root of Rhubarb cut, two ounces; Canella Bark bruised, one drachm; Diluted Alcohol, two ounces; Spanish White-wine, fifteen ounces. Macerate for seven days, and strain through paper."

Wine extracts the active matter of rhubarb, and this medicated wine operates as a purgative, in a dose from half an ounce to an ounce. The tincture is in general preferable, as more uniform, and not liable to decomposition.

Vinum Ferri. Wine of Iron. Lond.

"Take of Filings of Iron, two ounces; Wine, two pints. Mix and put aside for a month, shaking occasionally, then strain through paper."

Vinum Ferri. Wine of Iron. Dub.

"Take of Iron Wire in small pieces, four ounces; White Rhenish Wine, four pints. Sprinkle the pieces of iron with a little of the wine, and expose them to the air, until they are covered with rust; then add the remaining wine; digest for seven days, shaking the vessel occasionally, and lastly strain the wine."

The iron being oxidated by the joint action of the wine and the atmospheric air, a portion of the oxide is dissolved by the tartaric acid of the wine. The chalybeate impregnation must, however, be variable, according to the acidity of the wine, and it is therefore preferable to employ a preparation of more uniform strength. Lond.

Vinum Veratri. Wine of White Hellebore.

"Take of the Root of White Hellebore cut, eight ounces; Wine, two pints and a half. Macerate for fourteen days, and strain."

A strong infusion of white hellebore in wine has been said to form the basis of the empirical preparation, Eau Medicinale, lately celebrated for its efficacy in gout. It is with this view probably that this medicated wine has been introduced into the late edition of the London Pharmacopœia.

CHAP. XIII.

ACETICA.—MEDICATED VINEGARS.

Vinegar is capable of dissolving all those proximate principles of vegetables which are soluble in water, and with regard to some substances its acid appears to increase its solvent power. But it also often modifies their

medicinal qualities, either by the chemical changes it occasions, or by the action it exerts on the stomach. Hence there is only one medicated vinegar of any importance—the Vinegar of Squill; the active matter of this root being dissolved by it, and suffering apparently no alteration. The activity of colchicum appears to reside in a simliar acrid matter, and it also affords an active medicated vinegar, but of less importance, as colchicum is little employed. As a solvent of camphor, the concentrated acetic acid is used in one preparation.

Acidum Aceticum Aromaticum. Aromatic Vinegar. Ed.

"Take of the dried Tops of Rosemary, the dried Leaves of Sage, of each an ounce: Lavender Flowers dried, half an ounce; Cloves bruised, half a drachm; weak Acetic Acid, two pounds. Maccrate for seven days and strain the expressed liquor through paper."

This is an improved formula for a preparation long known by the name of Acetum Prophylacticum, which had attained celebrity as an antiseptic and preservative against contagion. From the impregnation of the vinegar with the flavour of the aromatic vegetables, it is a grateful perfume, but it is weak, and its ordour is soon lost.

Acidum Aceticum Camphoratum. Camphorated Acetic Acid. Ed.

"Take of strong Acetic Acid, six ounces; Camphor, half an ounce. Rub the camphor with a little alcohol into powder, which put into the acid, that it may be dissolved."

Acidum Aceticum Camphoratum. Dub.

"Take of Acetic Acid, six ounces; camphor, half an ounce; Rectified Spirit of Wine, as much as may be sufficient. Reduce the camphor to powder, by the aid of the spirit, then add the acid, and dissolve."

Camphor is soluble in the concentrated acetic acid, and the solution has an odour highly fragrant and pungent.—It has been used as a grateful stimulating perfume, and forms what is named Aromatic Spirit of Vinegar.

Acidum Aceticum Scilliticum. Vinegar of Squill. Ed.

"Take of Dried Squill, one ounce; Weak Acetic Acid, fifteen ounces; Strong Alcohol, an ounce and a half. Macerate the squill with the acid for seven days, then express the liquor and add the alcohol, and when the impurities have subsided, pour off the clear liquor."

Acetum Scillæ. Vinegar of Squill. Lond.

"Take of Squill Root recently dried, a pound; Vinegar, six pints; Proof-spirit, half a pint. Macerate the squill root with the vinegar in a close glass vessel with a gentle heat, for twenty-four hours; then express, and put aside, that the impurities may subside; lastly, add the spirit to the pure liquor."

Acetum Scillæ. Vinegar of Squill. Dub.

"Take of Squill Root recently dried, half a pound; Vinegar, three pints; Rectified Spirit of Wine, four ounces. Digest the squill root with the vinegar for four days in a glass vessel, agitating frequently; then express the vinegar, to which poured off, after the impurities subside, add the spirit."

Vinegar appears to dissolve the active matter of squill, without much impairing its powers: the addition of the alcohol is designed to counteract any spontaneous decomposition to which the vinegar might be liable. Under this form, squill has long been employed as an expectorant; the dose

is one drachm; or more usually it is given in the form of syrup, prepared form this medicated vinegar. The proportion of squill ordered by the different Colleges is very various, and if all its active matter is dissolved, must afford preparations of unequal strength.

Acetum Colchici. Vinegar of Meadow Saffron. Lond.

"Take of the Fresh Root of Meadow Saffron cut, one ounce: Distilled Vinegar, a pint; Proof-spirit, a fluidounce. Macerate the root with the vinegar, in a close glass vessel, for twenty-four hours; then press it out, and put it aside, that the impurities may subside; lastly, add the spirit to the clear liquor."

The active matter of colchicum is so far similar to that of squill, that it appears to be dissolved by vinegar, without its powers being altered. It has been given as a diuretic in dropsy, either under this form, or that of oxymel, but in modern practice is little employed.

CHAP. XIV.

TINCTURÆ.—TINCTURES.

Tinctures are solutions usually of vegetable, sometimes however, of animal, and even of mineral substances, in spiritous liquors. The solvent may be alcohol, either pure, diluted with water, or impregnated with ammonia or ether. Alcohol dissolves the resin, camphor, extract, and essential oil of plants; it is more particularly employed as the menstruum for substances purely resinous, or the powers of which reside in the resin. Where a portion of gum is mingled with the resin, or where tannin or extractive matter is the active principle, diluted alcohol is the proper solvent; it in general dissolves the active matter of all entire vegetable substances, as the bark, leaves, flowers: and wherever it can be properly applied, it is preferable to pure alcohol, both as more economical, and as less pungent. Alcohol, impregnated with ammonia, is employed only in forming tinctures of a few substances, with the medicinal operation of which ammonia is supposed to coincide.

Tinctures usually contain the active matter of the substances from which they are prepared, in a more concentrated state than infusions or decoctions do, the power of the solvent being much greater; hence they require to be given only in a small dose; and the power of the solvent, which is otherwise considerable, may in general be neglected. They have the still more important advantage of not being liable to spontaneous decomposition; the affinities of the elements of vegetable matter, whence new combinations are established, which are favoured by water, being counteracted by alcohol; and hence a tincture, if it be kept secluded from the air, so as to prevent the loss of the alcohol by evaporation, can be preserved any length of time without decomposition.

Tinctures are prepared by infusing the materials reduced to a coarse powder in spirit, with frequent agitation, but without the application of heat. By applying heat, the solvent power is so far promoted, that the impregnation is effected in a shorter time; but the inactive and grosser

matter, it has been supposed, is frequently liable to be extracted, and the temperature is farther unnecessary, as, by allowing the solvent to remain a sufficient time (seven days usually) on the ingredients, it is fully saturated. Alkaline salts were at one time supposed to increase the solvent power both of alcohol and diluted alcohol, the tincture being of a much deeper colour when a small portion had been added. But this arises, in part at least, from the action of the alkali on the colouring matter, as the same effect is obtained when they are added to a tincture already prepared; and even where they increase the solubility of some principles, as of resinous matter, they do not always coincide in medicinal operation with the substance operated on, while they render the tincture much more nauseous.

Some tinctures are liable to decomposition on diluting them with water, those especially prepared with pure alcohol, in which resinous matter chiefly is dissolved, the resin being precipitated. Even some tinctures prepared with diluted alcohol hold dissolved so much resin that they are rendered turbid by dilution with water; others, which contain extractive matter chiefly, or tannin, remain transparent. It sometimes happens even that a decomposition ensues on mixing a tincture prepared with alcohol with another prepared with diluted alcohol. Such decompositions require to be attended to in their administrations, and to be so far obviated, at least when the precipitation is copious, as that by trituration with mucilage the resinous matter shall be diffused.

"Tinctures are to be digested in close glass vessels, and frequently shaken during their preparation." Ed.

The general directions in the London and Dublin Pharmacopœias are nearly the same.

Tinctura Acaciæ Catechu. Tincture of Catechu. Ed.

"Take of Extract of Catechu in powder, three ounces; Cinnamon bruised, two ounces; Weaker alcohol, two pounds and a half. Digest for seven days, and strain through paper."

Tinctura Catechu. Tincture of Catechu. Lond. Dub.

"Take of Extract of Catechu, three ounces; Cinnamon bruised two ounces; Proof-spirit, two pints. Digest for seven days, (fourteen Lond.) and strain."

Catechu, consisting almost entirely of tannin and extractive matter, is dissolved by diluted alcohol, and is rendered more grateful by the cinnamon. It is a very pleasant astringent, and is employed in all those cases where the use of astringents is indicated, as in uterine fluxes, diarrhœas, &c.; dose, one to three drachms, taken either in water or wine.

Tinctura Aloes Socotorinæ. Tincture of Aloes. Ed.

"Take of Socotorine Aloes in powder, half an ounce; Extract of Liquorice, one ounce and a half; stronger Alcohol, four ounces; Water, one pound. Digest for seven days, and pour off the tincture when clear."

Tinctura Aloes. Tincture of Aloes. Lond.

"Take of Aloes bruised, half an ounce; Extract of Liquorice, an ounce and a half; Water, a pint; Rectified Spirit, four fluidounces. Macerate in a sand-bath until they are dissolved, then strain."

Tinctura Aloes. Tincture of Aloes. Dub.

"Take of Socotorine Aloes in powder, half an ounce; Extract of Li-

quorice, an ounce and a half, dissolved in eight ounces of Boiling Water; Proof-spirit, eight ounces. Digest for seven days; then strain."

In this preparation the liquorice is designed to cover the taste, which it does very imperfectly. The tincture may be employed as a cathartic in the dose of an ounce, but is seldom used: aloes, from its intense bitterness, being better prescribed under the form of pill.

TINCTURA ALOES ÆTHEREA. Ethereal Tincture of Aloes. Ed.

"Take of Socotorine Aloes, Myrrh, of each in powder, one ounce and a half; English Saffron cut, one ounce; Sulphuric Ether with Alcohol, a pound. Digest the Myrrh with the ether for four days; then add the saffron and aloes. Digest again for four days; and when the impurities have subsided, pour off the tincture."

If the ingredients of this tincture were digested together, the spirit would be so much saturated with the aloes, as to take up little of the myrrh; but by digesting it first on the myrrh, it dissolves a larger quantity of it, and is capable of dissolving afterwards a sufficient proportion of the aloes and saffron. The spirit of sulphuric ether affords a more grateful tincture than alcohol, but it is difficult to preserve the tincture long without the escape of the ether from its volatility. A similar preparation has long had a place in the Pharmacopœias, under the name of Elixir Proprietatis, and has been much used as a stimulant aperient in dyspeptic affections, jaundice and amenorrhœa, given in a dose of one or two drachms. In the dose of six drachms its acts as a cathartic.

TINCTURA ALOES ET MYRRHÆ. Tincture of Aloes and Myrrh. Ed.

"Take of Myrrh in powder, two ounces; Strong Alcohol, one pound and a half; Water, half a pound. Mix the alcohol with the water; then add the myrrh; digest for four days; and lastly, add of Socotorine Aloes in powder, one ounce and a half; English Saffron sliced, one ounce. Digest again for three days, and pour off the pure tincture."

TINCTURA ALOES COMPOSITA. Compound Tincture of Aloes. Lond.

"Take of Extract of Aloes, in powder, Saffron, of each three ounces; Tincture of Myrrh, two pints. Macerate fourteen days, and strain."

TINCTURA ALOES COMPOSITA. Compound Tincture of Aloes. Dub.

"Take of Tincture of Myrrh two pints; Socotorine Aloes in powder, Saffron, of each three ounces. Digest for seven days, then strain."

This tincture differs in little from the former but in the menstruum. Being less grateful, it is seldom administered internally, but is used as an application to bleeding wounds, and a stimulant to foul ulcers.

TINCTURA AMOMI REPENTIS. Tincture of Cardamom. Ed.

"Take of Cardamom Seeds bruised, four ounces; Diluted Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

TINCTURA CARDAMOMI. Tincture of Cardamom. Lond.

"Take of Cardamom Seeds bruised, three ounces; Proof-spirit, two pints. Macerate for fourteen days, and strain."

TINCTURA CARDAMOMI. Tincture of Cardamom. Dub.

"Take of Cardamom Seeds freed from the capsules and bruised, three ounces; Proof-spirit, two pints. Digest for seven days, and strain."

This tincture has merely aromatic flavour and pungency; and as these are not considerable, it is little used.

TINCTURA AMOMI ZINGIBERIS. Tincture of Ginger. Ed.

"Take of Ginger Root bruised, two ounces; Diluted Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

TINCTURA ZINGIBERIS. Tincture of Ginger. Lond.

"Take of Ginger Root cut, two ounces; Proof-spirit, two pints. Macerate for fourteen days, and strain."

TINCTURA ZINGIBERIS. Tincture of Ginger. Dub.

"Take of Ginger Root reduced to a coarse powder, two ounces; Proof-spirit, two pints. Digest for seven days, then strain."

This tincture contains the pungency of the ginger, and may be used as an aromatic, to cover the taste or flavour, or promote the operation of more active remedies. To obviate flatulence, ginger is generally taken in substance.

TINCTURA ARISTOLOCHIÆ SERPENTARIÆ. Tincture of Snake-Root. Ed.

"Take of Virginian Snake-Root bruised, two ounces; Cochineal in powder, one drachm; Diluted Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

TINCTURA SERPENTARIÆ. Tincture of Snake-Root. Lond.

"Take of Snake-Root, three ounces; Proof-spirit, two pints. Macerate fourteen days, and strain."

TINCTURA SERPENTARIÆ. Tincture of Snake-Root. Dub.

"Take of Virginian Snake-Root cut and bruised, three ounces; Proof-spirit, two pints. Digest for seven days, then strain."

Serpentaria is seldom exhibited under the form of tincture, and it would require indeed to be given in such a dose, that the power of the menstruum would be predominant. As a grateful bitter, it may be given occasionally in dyspepsia in a dose of two drachms.

TINCTURA BENZOINI COMPOSITA. Compound Tincture of Benzoin. Ed.

"Take of Benzoin in powder, three ounces; Balsam of Peru, two ounces; Hepatic Aloes, half an ounce; Strong Alcohol, two pounds. Digest for seven days, and strain through paper."

TINCTURA BENZOINI COMPOSITA. Compound Tincture of Benzoin. Lond.

"Take of Benzoin, three ounces; Storax strained, two ounces; Balsam of Tolu, an ounce; Aloes, half an ounce; Rectified Spirit, two pints. Macerate for fourteen days, and strain."

TINCTURA BENZOES COMPOSITA. Compound Tincture of Benzoin. Dub.

"Take of Benzoin, three ounces; Purified Storax, two ounces; Balsam of Tolu, an ounce; Socotorine Aloes, half an ounce; Rectified Spirit of Wine, two pints. Digest for seven days, then strain."

This is used externally as a styptic, to recent superficial wounds, and forms a useful corrugating and agglutinating application. It has long been in use under the name of Wade's Balsam and Friar's Balsam. A piece of linen moistened with it stops the hæmorrhage from a slight wound, and allows it to heal by the first intention. It is also sometimes applied as a stimulant to foul ulcers.

TINCTURA BONFLANDIÆ TRIFOLIATÆ. Tincture of Angustura. Ed.

"Take of Angustura Bark in powder, two ounces; Diluted Alcohol, two pounds and a half. Digest for seven days, then strain through paper."

TINCTURA ANGUSTURÆ. Tincture of Angustura. Dub.

"Take of Angustura Bark, in coarse powder, two ounces; Proof-spirit, two pints. Digest for seven days, then strain."

Diluted Alcohol dissolves the active matter of angustura; and under this form it has been sometimes given in dyspepsia, in a dose of two drachms occasionally.

Tinctura Camphoræ. Tincture of Camphor. Ed.

"Take of Camphor, one ounce; Strong Alcohol, one pound. Mix, so as to dissolve the camphor. It may be also made with a double or triple proportion of camphor."

Spiritus Camphoræ. Spirit of Camphor. Lond.

"Take of Camphor, four ounces; Rectified Spirit, two pints. Mix, so as to dissolve the camphor."

Spiritus Camphoratus. Camphorated Spirit. Dub.

"Take of Camphor an ounce; Rectified Spirit of Wine, eight ounces by measure. Mix, so as to dissolve the camphor."

This solution is used externally as a stimulating and anodyne application in chronic rheumatism and spasmodic pains, being rubbed on the part. It is applied in a similar manner to bruises and strains, to remove the swelling and relieve the pain. Linen moistened with it is used as an application to chilblains; and it is sometimes added in small quantity to collyria employed in ophthalmia.

Linimentum Camphoræ Compositum. Compound Camphor Liniment. Lond.

"Take of Camphor, two ounces; Water of Ammonia, six ounces; Spirit of Lavender, a pint. Mix the water of ammonia with the spirit, and distil a pint from a glass retort with a gentle heat. Dissolve the camphor in the distilled liquor."

This liniment is applied to the same uses as the preceding, but the addition of the ammonia renders it more powerful as a stimulant and rubefacient.

Tinctura Cantharidis Vesicatoriæ. Tincture of Cantharides. Ed.

"Take of Cantharides bruised, one drachm; Diluted Alcohol, one pound. Digest for seven days, and strain through paper."

Tinctura Lyttæ. Tincture of Cantharides. Lond.

"Take of Cantharides bruised, three drachms; Proof-spirit, two pints. Macerate for fourteen days, and strain."

Tinctura Cantharidis. Tincture of Cantharides. Dub.

"Take of bruised Cantharides, two drachms; Cochineal in powder, half a drachm; Proof-spirit, one pint and a half. Digest for seven days, and filter."

Diluted alcohol extracts and holds dissolved the acrid matter of cantharides, and it is under this form that the substance has been generally employed internally, being more manageable in its dose than it is in powder. It has been given as a diuretic in dropsy, and as a remedy in incontinence of urine, gleet, leucorrhœa, and some cutaneous diseases. Its dose is from ten to twenty drops, increased gradually until some sensible operation is produced. Dr. C. Smyth has remarked, however, that in ischuria arising from debility of the coats of the bladder, he had found little advantage derived from the tincture, while in substance the cantharides had been successful. The tincture is also employed externally as a rubefacient.

Tinctura Castorei. Tincture of Castor. Ed.

"Take of Russian Castor in powder, one ounce and a half; Strong Alcohol, one pound. Digest for seven days, and strain through paper."

Tinctura Castorei. Tincture of Castor. Lond.

"Take of Castor in powder, two ounces; Rectified Spirit, two pints. Macerate for seven days, and strain."

Tinctura Castorei. Tincture of Castor. Dub.

"Take of Russian Castor in powder, two ounces; Proof-spirit, two pints. Digest for seven days, and strain." (A tincture is ordered to be prepared in the same manner from Canadian Castor.)

Castor is a substance nearly inert; and this tincture, in which a small quantity only is dissolved, can scarcely be supposed to have any medicinal efficacy. It is given sometimes as an antispasmodic in hysteria, in a dose of from half a drachm to a drachm. It is more grateful when prepared with alcohol than when prepared with proof-spirit.

Tinctura Cinchonæ Lancifoliæ. Tincture of Peruvian Bark. Ed.

"Take of Lance-leaved Peruvian Bark in powder, four ounces; Diluted Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

Tinctura Cinchonæ. Tincture of Cinchona. Lond.

"Take of Lance-leaved Bark in powder, seven ounces; Proof-spirit, two pints. Macerate for fourteen days, and strain."

Tinctura Cinchonæ. Tincture of Cinchona. Dub.

"Take of Cinchona Bark in coarse powder, four ounces; Proof-spirit, two pints. Digest for seven days, and strain through paper."

The proportion of bark in the formula of the London College to that of spirit, is nearly double that of the others, whether with the effect of rendering the tincture much stronger may be considered as doubtful. The active matter of bark is extracted by diluted alcohol, but so sparingly, that it may be doubted whether in the tincture the powers of the menstruum are not greater than those of the bark. It cannot therefore be employed where large quantities of cinchona are required. It is used only as a bitter in dyspepsia, occasionally, in a dose of two drachms, and for this purpose the compound tincture of bark, to be immediately noticed, is preferable; though both are liable to the objection common to all these bitter tinctures, that of accustoming the stomach to the stimulus of ardent spirit, and leading to the habit of dram-drinking.

Tinctura Cinchonæ Composita. Compound Tincture of Cinchona. Ed.

"Take of Lance-leaved Cinchona Bark in powder, two ounces; Orange Rhind dried, one ounce and a half; Virginian Snake-Root bruised, three drachms; Saffron sliced, one drachm; Cochineal in powder, two scruples; Diluted Alcohol, twenty ounces. Digest for seven days, and strain through paper."

Tinctura Cinchonæ Composita. Compound Tincture of Cinchona. Lond.

"Take of Lance-leaved Cinchona in powder, two ounces; Dried Orange Peel, an ounce and a half; Virginian Snake-root, three drachms; Saffron, a drachm; Cochineal in powder, two scruples; Proof-spirit, twenty fluidounces. Macerate for fourteen days, and strain."

Tinctura Cinchonæ Composita. Compound Tincture of Cinchona. Dub.

"Take of Peruvian Bark powdered, two ounces; Orange Rhind, half an ounce; Virginian Snake-Root bruised, three drachms; Saffron, one drachm; Cochineal in powder, two scruples; Proof-spirit, twenty fluid-ounces. Digest for fourteen days, and strain."

This is the composition known under the name of Huxham's Tincture of Bark. It is more grateful than the simple tincture; and, from the substances added to the cinchona, is probably a better stomachic. It is principally in dyspeptic affections that it is employed. The powers of the menstruum render its continued use hurtful, but it may be taken occasionally with advantage.

Tinctura Cinnamomi Composita. Compound Tincture of Cinnamon. Ed.

"Take of Cinnamon Bark bruised, Cardamom Seeds bruised, each one ounce; Long Pepper, in powder, two drachms; Diluted Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

Tinctura Cinnamomi Composita. Compound Tincture of Cinnamon. Lond.

"Take of Cinnamon Bark bruised, six drachms; Cardamom Seeds bruised, three drachms; Long Pepper in powder, Ginger Root cut, of each two drachms; Proof-spirit, two pints. Macerate for fourteen days, and strain."

Tinctura Cinnamomi Composita. Compound Tincture of Cinnamon. Dub.

"Take of Cinnamon Bark bruised, six drachms; Cardamom Seeds freed from the capsules, three drachms; Long Pepper, Ginger, of each, in powder, two drachms; Proof-spirit, two pints. Digest for seven days and strain."

This is a grateful aromatic tincture, seldom used by itself, but frequently added to other tinctures, or to mixtures, to communicate flavour and pungency. It is thus often used in combination with bitters and astringents.

Tinctura Colombæ. Tincture of Colomba. Ed.

"Take of the Root of Colombo in powder, two ounces; Diluted Alcohol, two pounds. Digest for seven days, and strain through paper."

Tinctura Calumbæ. Tincture of Colomba. Lond.

"Take of Colomba Root cut, two ounces and a half; Proof-spirit, two pints. Macerate for fourteen days, and strain."

Tinctura Colombo. Tincture of Colomba. Dub.

"Take of Colombo Root in powder, two ounces; Proof-spirit, two pints. Digest for seven days, then strain."

Colombo does not yield its active matter very abundantly either to watery or spiritous menstrua; at least this tincture is not strong, and cannot be employed for any of the more important purposes for which this root is prescribed. It is therefore used merely as a bitter tincture in dyspepsia, in a dose of three or four drachms.

Tinctura Conii Maculati. Tincture of Hemlock. Ed.

"Take of Hemlock Leaves dried, two ounces. Lesser Cardamom Seeds bruised, half an ounce; Diluted Alcohol, sixteen ounces. Digest for seven days, and strain through paper."

This tincture possesses all the properties of the plant, and may be given in those cases where the use of the plant is indicated.

TINCTURA CONVOLVULI JALAPÆ. Tincture of Jalap. Ed.

"Take of the Root of Jalap in powder, three ounces; Diluted Alcohol, fifteen ounces. Digest for seven days, and strain through paper."

TINCTURA JALAPÆ. Tincture of Jalap. Lond.

"Take of Jalap Root in powder, eight ounces; Proof-spirit, two pints. Macerate for fourteen days, and strain."

TINCTURA JALAPÆ. Tincture of Jalap. Dub.

"Take of Jalap Root reduced to coarse powder, five ounces; Proof-spirit, two pints. Digest for seven days, then strain."

The activity of jalap resides in a resinous matter, which in this tincture is extracted along with a portion of mucilage. It may be given as a cathartic, in a dose of four or six drachms. Jalap, however, is usually given in substance, and scarcely ever under this form.

TINCTURA CROCI SATIVI. Tincture of Saffron. Ed.

"Take of English Saffron cut, one ounce; Diluted Alcohol, fifteen ounces. Digest for seven days, and strain through paper."

TINCTURA CROCI. Tincture of Saffron. Dub.

"Take of Saffron, an ounce; Proof-spirit, a pint. Digest for seven days, then strain."

This tincture is to be valued only for its colour.

TINCTURA CROTONIS ELEUTHERIÆ. Tincture of Croton Eleutheria. Ed.

"Take of Croton Eleutheria bruised, four ounces; Diluted Alcohol, two pounds and a half. Digest for seven days, and strain."

TINCTURA CASCARILLÆ. Tincture of Cascarilla. Lond.

"Take of Cascarilla Bark, four ounces; Proof-spirit, two pints. Macerate for fourteen days, and strain."

TINCTURA CASCARILLÆ. Tincture of Cascarilla. Dub.

"Take of Cascarilla Bark in coarse powder, four ounces; Proof-spirit, two pints. Digest for seven days, then strain."

Cascarilla is so little employed in modern practice, that there is scarcely any advantage in having its tincture as an officinal preparation.

TINCTURA DIGITALIS PURPUREÆ. Tincture of Foxglove. Ed.

"Take of dried Leaves of Foxglove, one ounce; Diluted Alcohol, eight ounces. Digest for seven days, and strain through paper."

TINCTURA DIGITALIS. Tincture of Foxglove. Lond.

"Take of the dried Leaves of Foxglove, four ounces; Proof-spirit, two pints. Macerate for fourteen days, and strain."

TINCTURA DIGITALIS. Tincture of Foxglove. Dub.

"Take of the Leaves of Foxglove (rejecting those of a large size) dried and reduced to coarse powder, two ounces; Proof-spirit, one pint. Digest for seven days, then strain."

The active matter of foxglove appears to be completely extracted by diluted alcohol The tincture is not, however, so much used to obtain the operation of the plant as a diuretic, as to produce its narcotic effects; and it is with this latter view that it has been introduced as the form under which foxglove is prescribed in hæmoptysis and phthisis: it has also the important advantages, that it can be kept without the powers of the digitalis being impaired, and that its dose is easily regulated. The usual dose is ten drops, which, according to the general rules observed in the adminis-

tration of digitalis, is to be continued, and if necessary, cautiously increased until its effects are obtained.

Tinctura Ferulæ Assafœtidæ. Tincture of Assafœtida. Ed.

"Take of Assafœtida, four ounces; Strong Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

Tinctura Assafœtidæ. Tincture of Assafœtida. Lond.

"Take of Assafœtida, four ounces; Rectified Spirit, two pints. Macerate for fourteen days, and strain."

Tinctura Assafœtidæ. Tincture of Assafœtida. Dub.

"Take of Assafœtida, four ounces; Rectified Spirit, two pints. Water, eight ounces by measure. To the assafœtida rubbed with the water, add the spirit. Digest for seven days, then strain."

Alcohol is used as the solvent in this tincture, as it is more grateful than when made with Proof-spirit. As a remedy in tympanitis and hysteria, it is sometimes given in a dose of one drachm; but in any quantity in which it can be given, so that the operation of the solvent shall not be predominant, its effects must be extremely trivial. It is decomposed on mixing it with water, and forms a white turbid liquor.

Tinctura Gallarum. Tincture of Galls. Ed.

"Take of Galls in powder, two ounces; Diluted Alcohol, sixteen ounces. Digest for seven days, and strain through paper."

Tinctura Gallarum. Tincture of Galls. Dub.

"Take of Galls in powder, four ounces; Proof-spirit, two pints. Mix them, digest for seven days, and filter."

This is perhaps the most powerful of all the astringent tinctures, and is given in a dose of one or two fluiddrachms.

Tinctura Gentianæ Composita. Compound Tincture of Gentian. Ed.

"Take of Gentian Root sliced and bruised, two ounces; dried Orange-Peel, one ounce; Canella Bark bruised, half an ounce; Cochineal in powder, half a drachm; Diluted Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

Tinctura Gentianæ Composita. Compound Tincture of Gentian. Lond.

"Take of Gentian Root cut, two ounces; Orange-Peel dried, an ounce; Cardamom Seeds bruised, half an ounce; Proof-spirit, two pints. Macerate for fourteen days with a gentle heat, and strain."

Tinctura Gentianæ Composita. Compound Tincture of Gentian. Dub.

"Take of Gentian Root cut and bruised, two ounces; dried Orange-Peel, an ounce; Cardamom Seeds, freed from the capsules, half an ounce; Proof-spirit, two pints. Digest for seven days, then strain."

In this tincture, the bitterness of the gentian is extracted, and it is rendered more grateful by the aromatic quality of the orange-peel and canella. It is used as a stomachic in a dose of two or three drachms, in cases where the stomach is disordered from any occasional cause. In more permanent forms of dyspepsia, it cannot be employed with equal advantage, and the continued use of tinctures of this kind ought always to be avoided, as being liable to the pernicious consequences of accustoming the stomach to the stimulus of ardent spirit.

Tinctura Guajaci Officinalis. Tincture of Guaiac. Ed.

"Take of the Resin of Guaiac in powder, six ounces; Strong Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

TINCTURA GUAJACI. Tinture of Guaiac. Lond.

"Take of the Gum-Resin of Guaiac rubbed to powder, half a pound; Proof-spirit, two pints. Macerate for fourteen days, and strain."

TINCTURA GUAJACI. Tincture of Guaiac. Dub.

"Take of Guaiac, four ounces; Rectified Spirit, two pints. Digest for seven days, and strain."

This Tincture may be given in a dose of two or three drachms, and has sometimes been employed as a form of giving guaiac in rheumatism and gout; but it is inferior in activity to the Ammoniated Tincture; and it forms a very ungrateful mixture with water, from the copious precipitation of its resinous matter.

TINCTURA HELLEBORI NIGRI. Tincture of Black Hellebore.

"Take of Black Hellebore Root bruised, two ounces; Cochineal, in powder, fifteen grains; Diluted alcohol, fifteen ounces. Digest for seven days, and strain through paper."

TINCTURA HELLEBORI NIGRI. Tincture of Black Hellebore. Lond.

"Take of Black Hellebore Root cut, four ounces; Proof-spirit, two pints. Macerate for fourteen days, and strain."

TINCTURA HELLEBORI NIGRI. Tincture of Black Hellebore. Dub.

"Take of Black Hellebore Root in coarse powder, four ounces; Cochineal in powder, two scruples; Proof-spirit, two pints. Digest for seven days, then strain."

It was under the form of this tincture that black hellebore was celebrated by Mead as an emmenagogue, in a dose of one drachm. Cullen remarks, with regard to it, that he had never found it successful, and it is now scarcely ever used.

TINCTURA HUMULI LUPULI. Tincture of Hops. Ed.

"Take of Hops, five ounces; Diluted Alcohol, two pounds and a half. Digest for seven days, express the tincture, and strain through paper."

TINCTURA HUMULI. Tincture of Hops. Lond.

"Take of Hops, five ounces; Proof-spirit, two pints. Macerate for fourteen days, and strain."

Hops having been introduced as a narcotic, designed to be employed as a substitute for opium, in cases where, from idiosyncrasy or other causes, the latter cannot be employed, the tincture affords a convenient form for its administration. It has been supposed to be nearly of the same strength as tincture of opium, but it requires in general to be given in a dose of from half a drachm to a drachm to produce much sensible effect.

TINCTURA HYOSCYAMI NIGRI. Tincture of Black Henbane. Ed.

"Take of the Dried Leaves of Black Henbane, one ounce; Diluted Alcohol, eight ounces. Digest for seven days, and strain through paper."

TINCTURA HYOSCYAMI. Tincture of Henbane. Lond.

"Take of the Dried Leaves of Henbane, four ounces; Proof-spirit, two pints. Macerate for fourteen days, and strain."

TINCTURA HYOSCYAMI. Tincture of Henbane. Dub.

"Take of the Dried Leaves of Black Henbane in coarse powder, two ounces and a quarter; Proof-spirit, a pint. Digest for seven days, then strain."

Henbane has been introduced in modern practice chiefly as a substitute

for opium in particular cases. The inspissated juice being liable to be variable in strength, the tincture has been employed, and has now a place in all the Pharmacopœias, nearly of the same strength. Its dose has been stated at twenty-five drops, but in general not much effect is obtained from it under a dose of half a drachm. A combination of it with tincture of opium, proves a more certain anodyne and narcotic than when it is given alone, and is in some measure free from the inconveniences which opium by itself is liable to produce: and, in particular, from the constipating effect of the latter.

Tinctura Kino. Tincture of Kino. Ed.

"Take of Kino in powder, two ounces; Diluted Alcohol, one pound and a half"

Tinctura Kino. Tincture of Kino. Lond.

"Take of Kino in powder, three ounces; Proof-spirit, two pints. Macerate for fourteen days, and strain."

Tinctura Kino. Tincture of Kino. Dub.

"Take of Kino in powder, three ounces; Proof-spirit, a pint and a half. Digest for seven days, then strain."

Kino consists principally of tannin; it is entirely soluble in diluted alcohol. The dose of the tincture is from half a drachm to a drachm; it is not unfrequently prescribed as an astringent.

Tinctura Lauri Cinnamomi. Tincture of Cinnamon. Ed.

"Take of Cinnamon Bark bruised, three ounces; Diluted Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

Tinctura Cinnamomi. Tincture of Cinnamon. Lond.

"Take of Cinnamon Bark bruised, three ounces; Rectified spirit, two pints. Macerate for fourteen days, and strain."

Tinctura Cinnamomi. Tincture of Cinnamon. Dub.

"Take of Cinnamon Bark bruised, three ounces and a half; Proof-spirit, two pints. Digest for seven days, then strain."

The diluted alcohol is impregnated with the aromatic flavour of cinnamon, and it is merely as possessing this flavour and a slight astringency that this tincture is used in mixtures.

Tinctura Myrrhæ. Tincture of Myrrh. Ed.

"Take of Myrrh in powder, three ounces; Strong Alcohol, twenty ounces; Water, ten ounces. Digest for seven days, and strain through paper."

Tinctura Myrrhæ. Tincture of Myrrh. Lond.

"Take of Myrrh bruised, four ounces; Rectified Spirit, two pints; Water, a pint. Macerate for fourteen days, and strain."

Tinctura Myrrhæ. Tincture of Myrrh. Dub.

"Take of Myrrh bruised, three ounces: Proof-spirit a pint and a half; Rectified Spirit, half a pint. Digest for seven days, then strain."

Myrrh being principally resinous, is not entirely soluble in common proof-spirit, and therefore alcohol less diluted is properly ordered for its solution in the Pharmacopœias. The tincture is used principally as an external stimulant and antiseptic application, more especially in affections of the teeth and gums, either directly applied, or added to detergent gargles.

TINCTURA OPII, *sive Thebaica; vulgo Laudanum liquidum.* Tincture of Opium. Ed.

"Take of Opium, two ounces; Diluted Alcohol, two pounds. Digest for seven days, and strain through paper."

TINCTURA OPII. Tincture of Opium. Lond.

"Take of Hard Opium in powder, two ounces and a half; Proof-spirit, two pints. Macerate for fourteen days, and strain."

TINCTURA OPII, *sive Tinctura Thebaica.* Tincture of Opium. Dub.

"Take of Hard Purified Opium in coarse powder, ten drachms; Proof-spirit, a pint. Digest for seven days, then strain."

In this tincture all the active matter of opium is dissolved, the residuum being impurities or insoluble matter, and a given quantity of the tincture having been found to produce the same effects on the system nearly as the quantity of opium which, by calculation, it contained, ought to do, allowance being made for the undissolved matter. The proportion of opium to each drachm of the tincture is five grains, but by evaporation it is found to yield only three grains and a half; twenty-five drops is supposed to be equal in power to one grain of solid opium, and is the dose commonly given to a person not accustomed to it. It is of the same strength nearly as ordered in the different Pharmacopœias. The London College formerly employed purified opium, for which they have now properly substituted crude opium, both as it was without any advantage to use purified opium in a preparation in which the crude opium is necessarily freed from its impurities, while it added considerably to the expense, and as the purified opium itself is variable in strength.

Laudanum, as this tincture is named, is given in all those cases in which opium is usually administered. and is preferred to it as being more speedy in its operation, more manageable in its dose, and more convenient for combination with other remedies. Where the stomach is in an irritable state, so as to be easily excited to vomiting, or where the operation of the opium is wished to be exerted more slowly, or more peculiarly on the intestinal canal, as in diarrhœa and spasmodic colic, it is given in the solid state and usually in the form of pill. Formerly laudanum was prepared with an addition of aromatics,—an addition probably useful in obviating nausea, or even the subsequent debilitating operation on the stomach. In prescribing it, an aromatic tincture may be advantageously combined with it. Externally the tincture is occasionally applied topically as a stimulant and anodyne.

TINCTURA OPII CAMPHORATA, *vulgo Elixir Paregoricum Anglorum.* Camphorated Tincture of Opium; commonly called Paregoric Elixir. Ed.

"Take of Camphor, two scruples; Benzoic Acid, Opium, of each a drachm; Diluted Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

TINCTURA CAMPHORÆ COMPOSITA. Compound Tincture of Camphor. Lond.

"Take of Camphor, two scruples; Hard Opium in powder, Acid of Benzoin, of each one drachm; Proof-spirit, two pints. Macerate for fourteen days, and strain."

TINCTURA OPII CAMPHORATA; *sive Elixir Paregoricum.* Camphorated Tincture of Opium, or Paregoric Elixir. Dub.

"Take of Hard Purified Opium in powder, Benzoic Acid, of each a

drachm; Camphor, two scruples; Essential Oil of Anise, a drachm; Proof-spirit, two pints. Digest for two days, then strain."

This is the tincture known under the name of Paregoric Elixir, which has been long in use as a mild opiate in catarrh. Half an ounce of it contains a grain of opium, and its usual dose is two tea-spoonfuls, taken at bed time. It is inferior in strength to the tincture which has a place in the Edinburgh Pharmacopœia, under the same popular name of Paregoric Elixir, the Ammoniated Tincture of Opium, but it is less pungent, and is hence frequently preferred to the other. The London College have given it its present name, rather than the former one, of Tinctura Opii Camphorata, to lessen the risk of its being confounded with Tincture of Opium in prescribing it, and they have omitted the Oil of Anise, the odour of which is rather ungrateful.

TINCTURA QUASSIÆ EXCELSÆ. Tincture of Quassia. Ed.
"Take of Shavings of Quassia, one ounce; Diluted Alcohol, two pounds and a half. Digest for seven days, and strain through paper."
TINCTURA QUASSIÆ. Tincture of Quassia. Dub.
"Take of the Wood of Quassia rasped, one ounce; Proof-spirit, two pints. Digest for seven days, then strain."

The bitterness of quassia may be sufficiently extracted in this preparation. These bitter tinctures appear, however, to be unnecessarily multiplied in the Pharmacopœias, especially as, from the action of the menstruum on the stomach, the form of tincture is not the best mode for the administration of this class of remedies.

TINCTURA RHEI. Tincture of Rhubarb. Ed.
"Take of the Root of Rhubarb cut, three ounces; Lesser Cardamom Seeds bruised, half an ounce; Diluted Alcohol, two pounds and a half. Digest for seven days, and strain through paper."
TINCTURA RHEI. Tincture of Rhubarb. Lond.
"Take of Rhubarb Root cut, two ounces; Cardamom Seeds bruised, half an ounce; Saffron, two drachms; Proof-spirit, two pints. Macerate fourteen days with a gentle heat, and strain."
TINCTURA RHEI. Tincture of Rhubarb. Dub.
"Take of Rhubarb Root cut, two ounces; Cardamom Seeds freed from the capsules and bruised, Liquorice cut, of each half an ounce; Saffron, two drachms; Proof-spirit, two pints. Digest seven days, then strain."

Proof-spirit extracts nearly all the active matter of rhubarb, and this tincture therefore has all its powers. It is sometimes prescribed in dyspeptic affections and in diarrhœa, in a dose from half an ounce to an ounce.

TINCTURA RHEI ET ALOES. Tincture of Rhubarb with Aloes. Ed.
"Take of the Root of Rhubarb cut, ten drachms; Socotorine Aloes, six drachms in powder; Lesser Cardamom Seeds bruised, half an ounce; Diluted Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

The cathartic power of the rhubarb is in this tincture increased by combination with the aloes. It is employed as a stimulating aperient and purgative, in a dose from half an ounce to an ounce, frequently also as an emmenagogue.

TINCTURA RHEI ET GENTIANÆ. Tincture of Rhubarb with Gentian. Ed.

"Take of Root of Rhubarb in slices, two ounces; Gentian Root cut, half an ounce; Diluted Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

This combination of gentian with rhubarb is supposed to render it a more useful remedy in dyspeptic cases; but the power of the one is so inconsiderable, compared with that of the other, that no important advantage is gained from it. Its dose is from two to four drachms.

Tinctura Saponis Camphorata, *vulgo Linimentum Saponaceum.* Camphorated Tincture of Soap, or Saponaceous Liniment.

"Take of Hard Soap in shavings, four ounces; Camphor, two ounces; Volatile Oil of Rosemary, half an ounce; Strong Alcohol, two pounds. Digest the soap with the alcohol, for three days, then strain and add the camphor and volatile oil, frequently shaking."

Linimentum Saponis Compositum. Compound Soap Liniment. Lond.

"Take of Hard Soap, three ounces; Camphor, one ounce; Spirit of Rosemary, one pint. Dissolve the camphor in the spirit, then add the soap, and macerate in a sand-bath until it be dissolved.

Linimentum Saponis. Soap Liniment. Dub.

"Take of Soap, three ounces; Camphor, one ounce; Spirit of Rosemary, one pint. Digest the soap in the spirit of rosemary until it be dissolved, and add the camphor."

Tinctura Saponis et Opii, *vulgo Linimentum Anodynum.* Tincture of Soap with Opium; commonly called Anodyne Liniment. Ed.

"Take of the shavings of Hard Soap, four ounces; Opium, one ounce; Camphor, two ounces; Volatile Oil of Rosemary, half an ounce; Strong Alcohol, two pounds. Digest the soap in the alcohol for three days, then strain the liquid, and add the camphor and oil to it, frequently shaking."

These are stimulants of considerable efficacy, and are in common use as an external application, by friction, in strains and rheumatic pains. The last one, however, from the addition of opium, is more powerful as an anodyne in rheumatism and spasms of the muscles. It is frequently successful in relieving pain by topical application, though the relief is often but temporary.

Tinctura Scillæ Maritimæ. Tincture of Squill. Ed.

"Take of the fresh Dried Root of Squill, two ounces; Diluted Alcohol, sixteen ounces. Digest for seven days, and strain through paper."

Tinctura Scillæ. Tincture of Squill. Lond.

"Take of Squill Root recently dried, four ounces; Proof-spirit, two pints. Digest for fourteen days, and strain."

Tinctura Scillæ. Tincture of Squill. Dub.

"Take of Squill Root recently dried, four ounces; Proof-spirit, two pints. Digest for seven days, then put aside, and when the impurities have subsided, pour off the pure liquor.

Squill, when employed as a diuretic, operates most effectually in substance: as an emetic or expectorant it is usually given under the form of the vinegar or syrup, the vinegar dissolving sufficiently its active matter, and correcting its nauseous taste. It is not apparent what particular advantage is to be derived from a tincture of it,—a preparation in which the acrimony of the squill must be very imperfectly covered. The dose of this tincture is from twenty to sixty drops.

Tinctura Sennæ Composita. Tincture of Senna. Ed.

"Take of the Leaves of Senna, two ounces; Root of Jalap bruised, one ounce; Coriander Seeds bruised, half an ounce; Diluted Alcohol, three pounds and a half. Digest for seven days, and to the tincture strained through paper add four ounces of refined sugar."

Tinctura Sennæ. Tincture of Senna. Lond.

"Take of the Leaves of Senna, three ounces; Caraway Seeds bruised, three drachms; Cardamom Seeds bruised, one drachm; Raisins freed from the stones, four ounces; Proof-spirit, two pints. Macerate for fourteen days with a gentle heat, and strain."

Tinctura Sennæ. Tincture of Senna. Dub.

"Take of the Leaves of Senna, a pound; Caraway Seeds, an ounce and a half; Cardamom Seeds freed from their capsules and bruised, half an ounce; Proof-spirit, a gallon. Digest fourteen days, and strain."

This forms a very excellent purgative tincture, less unpleasant in its taste than any of the other cathartic tinctures, not liable therefore to excite nausea, and at the same time operating with sufficient effect. Its dose is one ounce or ten drachms. In the London and Dublin Pharmacopœias, being prepared without the jalap, it is less active.

Tinctura Toluiferæ Balsami. Tincture of Tolu Balsam. Ed.

"Take of Balsam of Tolu, one ounce and a half; Strong Alcohol, one pound. Digest until the balsam is dissolved, and strain through paper."

Tinctura Balsami Tolutani. Tincture of Balsam of Tolu. Dub.

"Take of Tolu Balsam, an ounce; Rectified Spirit, a pint. Digest until the balsam is dissolved, then strain."

The tolu balsam is soluble in alcohol; but as it is a substance of no activity, this tincture is scarcely used but on account of its flavour, and for making the syrup of tolu according to the formula of the Edinburgh Pharmacopœia.

Tinctura Veratri Albi. Tincture of White Hellebore. Ed.

"Take of White Hellebore Root bruised, four ounces; Diluted Alcohol, sixteen ounces. Digest for seven days, and strain through paper."

White Hellebore is a medicine scarcely ever prescribed internally, its operation is so violent. The dose of this tincture cannot exceed a few drops. Neither is it used as an external application. According to Mr. Moore, a tincture of it, or rather a medicated wine, is the basis of the empirical preparation, the Eau Medicinale, lately celebrated as a remedy in gout; more recent discoveries have however shewn that the basis of that empirical preparation is colchicum.

The following Tinctures are peculiar to the London and Dublin Pharmacopœias.

Tinctura Aurantii. Tincture of Orange-Peel. Lond.

"Take of Fresh Orange-Peel, three ounces; Proof-spirit, two pints. Digest for fourteen days, and strain."

Tinctura Aurantii. Tincture of Orange-Peel. Dub.

"Take of Fresh Orange-Peel, three ounces; Proof-spirit, two pints. Digest for three days, and strain."

The alcohol is in this tincture impregnated with the flavour and bitterness of the orange-peel, and it may be used as communicating flavour, or in combination with more powerful bitters.

TINCTURA CAPSICI. Tincture of Capsicum. Lond.

"Take of Capsicum Berries, an ounce; Proof-spirit, two pints. Macerate for fourteen days, and strain."

Under this form capsicum may be employed as a stimulant and stomachic; and diluted, it may afford an easy mode of forming the capsicum gargle, which is employed in some forms of cynanche, half an ounce being added to eight ounces of water.

TINCTURA CARDAMOMI COMPOSITA. Compound Tincture of Cardamom. Lond.

"Take of Cardamom Seeds, Caraway Seeds, Cochineal, of each beat to powder, two drachms; Cinnamon Bark bruised, half an ounce; Raisins freed from the stones, four ounces; Proof-spirit, two pints. Macerate for fourteen days, and strain."

TINCTURA CARDAMOMI COMPOSITA. Compound Tincture of Cardamom. Dub.

"Take of Cardamom Seeds freed from their capsules, and bruised, Cochineal in powder, Caraway Seeds bruised, of each two drachms; Cinnamon Bark bruised, half an ounce; Proof-spirit, two pints. Digest for fourteen days, then strain."

This tincture may be employed as a grateful aromatic and carminative.

TINCTURA RHEI COMPOSITA. Compound Tincture of Rhubarb. Lond.

"Take of Root of Rhubarb cut, two ounces; Liquorice Root, bruised, half an ounce; Ginger Root cut, Saffron, of each two drachms; Proof-spirit, a pint; Water, twelve fluidounces. Macerate for fourteen days with a gentle heat, and strain."

The principle in which the purgative quality of rhubarb resides, has been supposed to be more completely dissolved by water than by other solvents; hence a larger proportion of water is prescribed in the formula for this tincture than usual, and the quantity of alcohol is little more than is necessary to prevent spontaneous decomposition. It medium dose as a purgative is an ounce.

TINCTURA VALERIANÆ. Tincture of Valerian. Lond.

"Take of Valerian Root, four ounces; Proof-spirit, two pints. Macerate for fourteen days, and strain."

TINCTURA VALERIANÆ. Tincture of Valerian. Dub.

"Take of Valerian Root in coarse powder, four ounces; Proof-spirit, two pints. Digest for seven days, then strain."

The active matter of valerian is sufficiently extracted by diluted alcohol; but the powers of the menstruum probably exceed those of the dissolved matter, and hence this tincture cannot be employed with much advantage.

TINCTURA GALBANI. Tincture of Galbanum. Dub.

"Take of Galbanum cut into small pieces, two ounces; Proof-spririt, two pints. Digest them for seven days, then strain."

This tincture has sometimes been used in hysteria, and to obviate flatulence in a dose of two or three drachms. It can scarcely be supposed to have any power.

TINCTURA MOSCHI. Tincture of Musk. Dub.

"Take of Musk in powder, two drachms; Rectified Spirit, one pint. Digest for seven days, and strain."

This tincture can be employed only to communicate the odour of musk; and is therefore of little importance.

CHAP. XV.

TINCTURÆ AMMONIATÆ.—AMMONIATED OR VOLATILE TINCTURES.

THE character of Ammonia being so very marked, and its action upon the animal system so powerful, the Edinburgh College have appropriated a separate chapter to the consideration of those Tinctures, in the composition of which it forms a principal ingredient.

TINCTURA AROMATICA AMMONIATA. Ammoniated Aromatic Tincture. Ed.

"Take of Ammoniated Alcohol, eight ounces; Volatile Oil of Lemon-Peel, one drachm; Volatile oil of Rosemary, one drachm and a half. Mix, so as to dissolve the oils.

SPIRITUS AMMONIÆ AROMATICUS. Aromatic Spirit of Ammonia. Lond.

"Take of Cinnamon Bark bruised, Cloves bruised, of each two drachms; Lemon Rhind, four ounces; Sub-carbonate of Potash, half a pound; Muriate of Ammonia, five ounces; Rectified Spirit, four pints; Water, a gallon. Mix, and distil six pints."

SPIRITUS AMMONIÆ AROMATICUS. Aromatic Spirit of Ammonia. Dub.

"Take of Spirit of Ammonia, two pints; Essential Oil of Lemon, two drachms; Nutmegs bruised, half an ounce. Digest in a close vessel for three days, occasionally agitating, and distil a pint and a half."

By this combination of ammonia with alcohol, and the addition of the aromatic oils, a preparation is obtained more grateful than spirit of ammonia. It is therefore often used in preference to the other, as a stimulant in languor and faintness, or to relieve flatulence, and sometimes as an antacid. Its dose is from fifteen to thirty drops.

TINCTURA ASSAFŒTIDA AMMONIATA. Ammoniated Tincture of Assafœtida. Ed.

"Take of Assafœtida, half an ounce; Ammoniated Alcohol, eight ounces. Digest in a close vessel for twelve hours, then distil, by the heat of boiling water, eight ounces."

SPIRITUS AMMONIÆ FŒTIDUS. Fœtid Spirit of Ammonia. Lond.

"Take of Spirit of Ammonia, two pints; Assafœtida, two ounces. Macerate for twelve hours, and distil, with a slow fire, into a cooled receiver, a pint and a half."

SPIRITUS AMMONIÆ FŒTIDUS. Fœtid Spirit of Ammonia. Dub.

"Take of Spirit Ammonia, two pints; Assafœtida, an ounce and a quarter. Digest in a close vessel for three days. occasionally shaking; pour off the clear liquor, and distil a pint and a half."

The impregnation of the ammoniated alcohol, with part of the assafœtida

in this process, though it may communicate a fœtid smell, can add little to its activity; and accordingly, though it has a place in all the Pharmacopœias, it is not found in the shops. It has been given in hysteria in a dose of thirty drops.

TINCTURA CASTOREI COMPOSITA. Compound Tincture of Castor. Ed.

"Take of Castor, an ounce; Assafœtida, half an ounce; Ammoniated Alcohol, one pound. Digest for seven days, and strain through paper."

This is a very active preparation, and is given with great advantage in hysteria, flatulent colic, cramp of the stomach, &c. in doses of from one to two drachms.

TINCTURA GUAJACI AMMONIATA. Ammoniated Tincture of Guaiac. Ed.

"Take of the Resin of Guaiac, four ounces; Ammoniated Alcohol, one pound and a half. Digest for seven days, and strain through paper."

TINCTURA GUAJACI AMMONIATA. Ammoniated Tincture of Guaiac. Lond.

"Take of the Gum-Resin of Guaiac in powder, four ounces; Aromatic Spirit of Ammonia, a pint and a half. Macerate for fourteen days, and strain."

TINCTURA GUAJACI AMMONIATA. Ammoniated Tincture of Guaiac. Dub.

"Take of Guaiac, four ounces; Spirit of Ammonia, a pint and a half. Digest for seven days, then strain."

As the ammonia coincides with the guaiac as a stimulant and diaphoretic, this affords a preparation of more efficacy than the simple tincture, and it is more frequently employed. It is given in chronic rheumatism in a dose of from one to two drachms.

TINCTURA OPII AMMONIATA; *olim Elixir Paregoricum.* Ammoniated Tincture of Opium, formerly Paregoric Elixir. Ed.

"Take of Opium, two drachms; Saffron sliced, Benzoic Acid, of each three drachms; volatile oil of Anise, half a drachm; Ammoniated Alcohol, sixteen ounces. Digest for seven days, and strain through paper."

This formula is designed as the improvement of a preparation which has long been medicinally employed under the name of Paregoric Elixir, and which, as a weak and pleasant opiate, has in particular been used as a remedy in catarrh. The formula, however, is but ill contrived. While the ammonia can add nothing to the efficacy of the preparation, its pungency renders it ungrateful, and the tincture approaches too nearly in strength to the common tincture of opium. The paregoric Elixir of the London and Dublin Pharmacopœias, and which has been introduced into the last edition of the Edinburgh Pharmacopœia, (Tinct. Opii Camphorata, already noticed,) is better adapted to the purposes for which it is designed. The composition of the Edinburgh College contains a grain of opium in a drachm, and this is its medium dose. The other does not contain more than a grain in half an ounce

The operation of the opium cannot be much influenced by the substances with which it is combined in this formula. The common application of it is as a remedy in catarrhal affections Its dose is from half a drachm to a drachm, taken generally at bed-time.

TINCTURA VALERIANÆ AMMONIATA. Ammoniated Tincture of Valerian. Ed.

"Take of Valerian Root bruised, four ounces; Ammoniated Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

TINCTURA VALERIANÆ AMMONIATA. Ammoniated Tincture of Valerian. Lond.

"Take of Valerian Root, four ounces; Aromatic Spirit of Ammonia, two pints. Macerate for fourteen days, and strain."

TINCTURA VALERIANÆ AMMONIATA. Ammoniated Tincture of Valerian. Dub.

"Take of Valerian in powder, two ounces; Spirit of Ammonia, a pint. Digest for seven days, then strain."

This tincture is more powerful than the simple tincture, from the impregnation of ammonia. It is given in hysteria, in a dose of from one to two drachms.

SPIRITUS AMMONIÆ SUCCINATUS. Succinated Spirit of Ammonia. Lond.

"Take of Mastich, three drachms; Rectified Spirit nine fluiddrachms; Oil of Lavender, fourteen minims; Oil of Amber, four minims; Water of Ammonia, ten fluidounces. Macerate the mastich in the spirit, so that it may be dissolved, and pour off the clear solution; add to this the other ingredients, and mix them all by agitation."

Spirit of ammonia, impregnated with oil of amber and some other essential oils, has been in use as a stimulating perfume under the name of Eau de Luce. A composition had been introduced into the London Pharmacopœia as a substitute for this, which had not, however, its usual milky appearance. This is given in the present formula by the addition of the mastich, the resinous matter of which is separated by the water, but is retained in a state of suspension, probably by the action of the alkali.

TINCTURA CINCHONÆ AMMONIATA. Ammoniated Tincture of Bark. Lond.

"Take of Pale Peruvian Bark bruised, four ounces; Aromatic Spirit of Ammonia, two pints. Macerate for ten days, and strain."

A tincture similar to this had formerly a place in the London Pharmacopœia, but was expunged; it is not obvious on what grounds it is restored; for there seems to be little propriety in employing spirit of ammonia as a menstruum of bark, as they scarcely coincide in any important virtue, and the activity of the ammonia must be much superior to that of the quantity of bark dissolved.

CHAP. XVI.

ÆTHEREA.—ETHER, AND ETHEREAL SPIRITS.

ACIDUM SULPHURICUM AROMATICUM. Aromatic Sulphuric Acid. Ed.

"Take of Alcohol, two pounds; Sulphuric Acid, six ounces Drop the acid gradually into the alcohol. Digest the mixture with a very gentle heat in a close vessel for three days, then add of Bark of Cinnamon bruised, one ounce and a half; of Ginger bruised, one ounce. Digest again in a close vessel for six days; then strain through paper placed in a glass funnel."

The dilution of the acid by the alcohol in the proportions in which they are mixed in this preparation, is such, that little chemical action appears to be exerted during the digestion; an odour somewhat peculiar is acquired, but the acidity is little impaired. The aromatics render it more pleasant, and the preparation may be considered therefore as a grateful one for the exhibition of sulphuric acid. Its dose is thirty drops, given in a cupful of water. It is not unfrequently used in dyspepsia, hæmoptysis, and other diseases in which this acid is employed.

Æther Sulphuricus. Sulphuric Ether. Ed.

"Take of Sulphuric Acid, Strong Alcohol, of each thirty-two ounces. Pour the alcohol in a glass retort capable of bearing a sudden heat. Then pour on the acid in an uninterrupted stream. Mix them gradually by frequent and gentle agitation; then immediately distil from a sand-bath, previously heated for this purpose, into a receiver kept cool with water or snow. Let the heat be regulated in such a manner that the liquor may be made to boil as soon as possible, and continue to boil until sixteen ounces have distilled over; then remove the retort from the sand. To the distilled liquor add two drachms of potash; then distil again from a high-necked retort, with a very gentle heat, into a receiver kept cool, until ten ounces have passed over. If to the acid remaining in the retort after the first distillation, sixteen ounces of strong alcohol be added, and the distillation be repeated, ether will again be produced. And this may be often repeated."

Æther Sulphuricus. Sulphuric Ether. Lond.

"Take of Rectified Spirit, Sulphuric Acid, of each a pound and a half. Pour the spirit into a glass retort, and add to it gradually the acid shaking frequently, and taking care that the heat do not rise higher than 120°, until they are mixed together. Then place the retort cautiously in a sand-bath previously heated to 200°, so that the liquor may boil as quickly as possible, and let the ether pass into a tubulated receiver, to which another is adapted kept cool by ice or water. Distil the liquor until a heavier portion begin to pass over, which will be observed beneath the ether at the bottom of the receiver. To the liquor which remains in the retort, add again twelve ounces of Rectified Spirit, so that ether may distil in a similar manner."

Ether Rectificatus. Rectified Ether. Lond.

"Take of Sulphuric Ether, fourteen fluidounces; Fused Potash, half an ounce; Distilled Water, two fluidounces. Dissolve first the potash in the water, add to it the ether, shaking thoroughly, until they are mixed; lastly, distil twelve ounces of rectified ether with a heat of about 120°, from a large retort into a vessel kept cold."

Liquor Æthereus Sulphuricus. Sulphuric Ethereal Liquor. Dub.

"Take of Rectified Vinous Spirit, Sulphuric Acid, of each thirty-two ounces. Pour the spirit heated to 120° into a retort capable of bearing a sudden heat, and pour upon it the acid in a continued stream. Mix them gradually, and distil with a heat sufficiently strong and quickly raised, twenty ounces by measure of liquor into a receiver kept cool. If to the acid remaining in the retort, sixteen ounces of rectified spirit are added, sulphuric ethereal liquor will again be obtained by distillation."

Æther Sulphuricus. Sulphuric Ether. Dub.

"Take of Sulphuric Ethereal Liquor, twenty ounces; Subcarbonate of Potash, dry and in powder, two drachms. Mix them, and distil twelve ounces by measure from a high-necked retort, with a very gentle heat into

a receiver kept cold. The specific gravity of this liquid is to that of distilled water as 765 to 1000."

The directions in the Pharmacopœias, for conducting this process, are nearly the same. The principal peculiarity in the formula of the London Pharmacopœia, is that of adding the acid gradually to the spirit, agitating the mixture after each addition; but on account of the rise of temperature as the mixture proceeds, this is more difficult than the mode directed by the Edinburgh College, of mixing the whole acid and alcohol at once, and any loss of ethereal vapour from the sudden action produced by the mixture in the latter mode is very trivial. The direction given by the Dublin College, to heat the spirit to 120° before adding the acid, must render the making the mixture more difficult, and endanger the breaking of the retort from pouring in the dense cold acid.

On mixing equal weights of sulphuric acid and alcohol, a mutual action, marked by an elevation of temperature and change of colour, is produced, and a vapour is disengaged, of an ethereal smell. On raising the temperature by the application of heat, so as to cause the mixed liquid to boil, ether is formed, and distils over. This continues for a considerable time; towards the end of this stage of the process, the liquid in the retort becomes capable of sustaining a higher temperature, and along with the ether there is produced a white vapour, which condenses in streaks having an oily appearance, in the neck of the retort, and this increasing, collects in the form of a dense oily-like fluid, named Oil of Wine, or Ethereal Oil, which falls to the bottom of the receiver. A quantity of olefiant gas is at the same time formed, and such a quantity of carbonaceous matter is separated from the alcohol that the liquor becomes of a deep brown colour. If the heat be continued beyond this, there is a sudden and copious production of sulphurous acid gas, which, not escaping easily from the heavy liquor in the retort, causes it to swell up, and if not removed from the fire, it will pass over into the receiver. The principal difficulty, therefore, in conducting the process, is to continue the distillation, so as to obtain the largest produce of ether, without bringing over the liquor from the retort. The rule given in the Edinburgh Pharmacopœia is to continue it until the liquor condensed in the receiver is equal to half the quantity of alcohol that had been employed: as when this has been obtained, the formation of ether will have nearly ceased; this however is not easily ascertained with accuracy. The London College directs the distillation to be continued until the ethereal oil is produced; and if care be taken to guard against the sudden swelling up of the liquor in the retort, this may be done, and rather a larger product obtained. The production of this oil is not however uniform. The most simple rule is, that whenever the neck of the retort becomes obscured with white vapours, the fire should be withdrawn; and if the materials begin to swell, the retort ought to be raised in the sand. The receiver requires to be kept cool by immersion in water, or causing water to trickle over it, in order to promote the condensation of the ether; and care ought to be taken to avoid approaching a burning body to the apparatus, as accidents have sometimes happened, when the vessels were not closely luted, from the volatility and inflammability of the ethereal vapour.

There is considerable difficulty in establishing the theory of the formation of ether. As the process proceeds, the liquor in the retort assumes a dark colour, and a quantity of carbonaceous matter, somewhat bituminous

is diffused through it; it is likwise diluted with water, and another portion of water distils over with the ether. These changes accompany the formations of the ether, and must be referred to changes in the composition of the alcohol. The explanation usually given of them proceeded on the assumption, that the acid yields oxygen, which, combining with the hydrogen of the alcohol, forms water; the balance of affinities being thus broken, part of the carbonaceous matter of the alcohol is separated, and its remaining hydrogen and carbon, with any oxygen it may contain, entering into combination, form the ether. To this theory, it was objected by Fourcroy and Vauquelin, that the decomposition of the sulphuric acid is not essential to the formation of ether: it may take place towards the end of the process when the temperature is high, and the liquor is loaded with carbonaceous matter; but there is no indication of it in the earlier stage, during which principally ether is formed; there is no evolution of sulphurous acid, and if the process be stopt at this stage, the whole acid they found to be undecomposed, the residual liquid being capable of saturating as much of an alkaline base, as the quantity of sulphuric acid employed would do. This led, therefore, to a different view of the agency of the acid. Instead of communicating oxygen, they supposed it to operate by a disposing affinity, causing part of the oxygen and hydrogen of the alcohol to combine and form water; the equilibrium of affinities being thus subverted, carbonaceous matter is precipitated from the alcohol, and new affinities being exerted, ether is the product of the combination of its remaining elements. The subject, however, still remains obscure. The fact, with regard to the acid not being decomposed, is not certain; for a small quantity of sulphurous acid, if produced, may be retained in the residual liquid or combined with some of the products; and the power of the liquid to saturate as much of an alkaline base, as the sulphuric acid used in the process could do, may be owing to the formation, by oxygenation of the elements of the alcohol of acetic or oxalic acid, both of which indeed exist in the residual liquor. The fact, that those acids form ethers most readily from alcohol, which yield oxygen most readily, favours the supposition, that a communication of oxygen from the acid is necessary to the commencement of the series of changes.

It is sufficiently proved, however, that the decomposition of the acid is not necessary to any great extent, for the residual liquor is capable of converting a fresh portion of Alcohol into ether: and as this is economical, it is ordered in the Pharmacopœias. And its power of doing so appears to diminish progressively, not so much from exhaustion of the acid as from its becoming too much diluted with water This water may have either pre-existed in the alcohol, or be formed by combination of portions of its oxgen and hydrogen. The carbonaceous matter which is precipitated, is obviously derived from the alcohol; and its separation led to the conclusion that less carbon exists in the composition of ether than in that of alcohol; that hydrogen, therefore, predominates in the former, and to this its greater volatility and levity were ascribed. Both alcohol and ether in burning afford water and carbonic acid; and from the comparative quantities afforded by each, Cruickshank inferred that the proportion of carbon to hydrogen is in ether as 5 to one nearly, while in alcohol it is as 8 or 9 to 1. The younger Saussure, on the contrary, inferred, from the products of their detonation with oxygen, that ether contains more carbon and hydrogen than alcohol, but less oxygen. The proportions he assigns are 59 carbon, 22 hydrogen, and 19 oxygen. He found that in its com-

bustion, when it has been properly rectified, it yields no trace of sulphuric acid,—a proof that neither the acid, nor the base of the acid, enters into its composition, a circumstance in which it differs from the ethers formed from some of the other acids.

Ether obtained by the first distillation is not pure. It is diluted with a considerable proportion of water, sometimes also it contains alcohol, and very generally a portion of sulphurous acid, which had been evolved towards the end of the distillation. To free it from these is the object of the directions for its rectification, which are nearly the same in the different Pharmacopœias, the product of the first distillation being again distilled from potash, in a high-necked retort, with a gentle heat, the potash detaining the sulphurous acid by the affinity it exerts to it, and rendering the water also less volatile. A portion of water is ordered to be added to the potash and ether in the London Pharmacopœia, which may be useful by attracting the alcohol more effectually: it causes, however, some waste of ether. And as all the Colleges admit of a second distillation from the residual liquor, mixed with a fresh portion of alcohol, directions ought to be given with regard to the rectification of the product of this, for it is considerably weaker than the product of the first distillation. The two products ought to be mingled together, and then rectified. If the unrectified ether be much impregnated with sulphurous acid, from the distillation having been continued longer than usual, it will be useful in the process of rectification to add a little black oxide of manganese, which yielding oxygen to the sulphurous acid, converts it into sulphuric, and abstracts it more effectually than is done by the alkali alone. After the acid has been abstracted, the ether may still have an intermixture of alcohol which has distilled over unchanged. This can only be abstracted by agitation with water, which dissolves it. This ought to be done, therefore, previous to the distillation from the potash; the unrectified ether being agitated with an equal quantity of water, the liquid which floats above the water, when the agitation has ceased, being drawn off, the due proportion of potash being added to it, and the distillation being performed as directed in the Pharmacopœias. The ether is thus obtained in its purest form. In the London and Dublin Pharmacopœias, both the Unrectified and Rectified Ether have a place. The Edinburgh College, with more propriety, admit of no distinction, but name the product when rectified, Sulphuric Ether, and sanction its use only in this state.

Sulphuric Ether has a peculiar odour, strong and diffusive, but not pungent; its taste is warm and penetrating: it is colourless and transparent; its specific gravity is 0.732, and when highly rectified is so low as .716; it is therefore one of the lightest liquids. It is also one of the most volatile; it evaporates rapidly at common temperatures; it boils in vacuo, even below 32, and under the atmospheric pressure at 98°. In evaporating it absorbs much caloric; hence, if dropt on the hand, it quickly disappears, producing on the spot a sensation of cold; and this affords a good test of its purity, the volatility being greater as it is more highly rectified. It is soluble in alcohol in every proportion; in water it dissolves only in the limited proportion of one part to ten; and this affords another test of its proper preparation, as if more soluble it is diluted either with water or alcohol.

Its medicinal properties have been already considered. It is employed principally as an antispasmodic in asthma, hysteria, singultus, and other morbid affections connected with spasm, being given in a dose of from

half a drachm to a drachm. And it is sometimes applied externally as a stimulant, or, from the cold attending its evaporation, as a remedy, to burns.

Æther Sulphuricus cum Alcohole. Sulphuric Ether with Alcohol. Ed.

"Take of Sulphuric Ether, one part; Strong Alcohol, two parts. Mix them together."

Spiritus Ætheris Sulphurici. Spirit of Sulphuric Ether. Lond.

"Take of Sulphuric Ether, half a pint; Rectified Spirit, a pint. Mix them.

A process had formerly a place in the Pharmacopœias, in which sulphuric acid and alcohol were submitted to distillation, the proportion of alcohol being larger than the acid could convert into ether. A portion, therefore, distilled over unchanged on the first application of the heat, and served to dilute the ether that followed. For this preparation, which had been employed under the name of Sweet Spirit of Vitriol, the present has been substituted, but it has no peculiar advantage, and is seldom prescribed.

Æther Sulphuricus cum Alcohole Aromaticus. Aromatic Sulphuric Ether with Alcohol. Ed.

"Take of Cinnamon Bark bruised, Cardamom seeds bruised, of each an ounce; Long Pepper bruised, two drachms; Sulphuric Ether, with Alcohol, two pounds and a half. Digest for seven days, and strain through paper."

Spiritus Ætheris Aromaticus. Aromatic Spirit of Ether. Lond.

"Take of Cinnamon Bark bruised, three drachms; Cardamom Seeds in powder, a drachm and a half; Long Pepper in powder, Ginger Root cut, of each a drachm; Spirit of Sulphuric Ether, a pint. Macerate for fourteen days in a glass vessel closed, and strain."

The addition of these aromatics to the sulphuric ether in this formula is of so little importance, that the prepartion is scarcely ever used, and from the quantity of ether imbibed by the material, is a very uneconomical one.

Oleum Æthereum. Æthereal Oil. Lond.

"The liquor remaining after the distillation of sulphuric ether, distil with a very gentle heat, until a black froth swells up; then immediately remove the retort from the fire. To the liquor which remains in the retort, add water, so that the oily part may float upon it. Draw this off, and mix with it lime-water, as much as may be sufficient to neutralize the acid which is contained in it, agitating them together. Lastly, withdraw the ethereal oil after it has separated."

Liquor Æthereus Oleosus. Oily Ethereal Liquor. Dub.

"Take the liquor remaining in the retort after the distillation of sulphuric ether. Distil it with a moderate heat to one half."

The product obtained by these processes is probably the same; it is the substance long known by the name of Oil of Wine: in the first process it is formed but not distilled over; in the second, it is obtained by distillation, though to conduct this is attended with considerable difficulty, from the re-action of the carbonaceous matter, which has been separated from the alcohol, on the sulphuric acid. The London process, according to Mr. Phillips, does not succeed. The nature of this oily substance has not been well determined. It has been considered as a compound of ether

and sulphurous acid: it is not proved that by the combination of these it can be formed, but by agitation with potash they are obtained from it, which proves that sulphurous acid enters into its composition. Fourcroy and Vauquelin supposed, that it is analogous to ether, differing from it in containing a larger proportion of carbon. It can be formed more directly by distilling ether from sulphuric acid. It is thick, unctuous in appearance, less volatile than ether, and soluble both in it and in alcohol. It is applied to no medicinal use, but in forming the following preparation:

Spiritus Ætheris Sulphurici Compositus. Compound Spirit of Sulphuric Ether. Lond.

"Take of Spirit of Sulphuric Ether, a pint; Ethereal Oil, two fluid-drachms. Mix them."

A composition had been in use under the name of Hoffman's Anodyne Liquor, which consisted of alcohol, with a portion of ether and ethereal oil. This, after having been discarded from the Pharmacopœias, has been restored in the present preparation, on the supposition that it possesses superior powers as an anodyne. It probably differs, however, in nothing from ether with alcohol, at least there is no distinct proof of any peculiarity of operation being communicated by the ethereal oil.

Æther Nitrosus. Nitrous Ether. Dub.

"Take of Nitrate of Potash, dried and in coarse powder, one pound and a half; Sulphuric Acid, one pound; Rectified Vinous Spirit, nineteen ounces by measure. Put the nitrate of Potash into a tubulated retort, placed in a bath of cold water; and add to it gradually, and in small quantities, the sulphuric acid and alcohol, previously mixed and allowed to become cold. Without any external heat, or with only such a slight degree of it as may be communicated by the addition of a little tepid water to the bath, an ethereal liquor will begin to distil. In a short time, the heat in the retort will increase spontaneously, and a considerable ebulliton will take place, which must be moderated by adding a portion of cold water to the bath. It is necessary also, that the receiver should be kept cold with water or snow, and it ought to be furnished with an apparatus adapted to transmit through a pound of rectified spirit, in a phial kept cold, the highly elastic vapour, disengaged suddenly, and with great force, from the mixture, if the heat is raised rather too high. The ethereal liquor thus obtained by spontaneous distillation is to be put into a phial closely stopt with a glass stopper; and to neutralize the excess of acid, as much subcarbonate of potash, dry and in powder, is to be added as is necessary, closing the phial after each addition, and determining the neutralization by the test of litmus. This is generally attained on the addition of about a drachm of the salt, and in a short time the nitrous ether rises to the surface, and may be withdrawn by a funnel. To obtain the ether in its purest state, distil it again from a water-bath, heated to about 140°, to one half. Its specific gravity is to that of distilled water as 900 to 1000."

The process for preparing nitrous ether has always been found difficult, from the great susceptibility of decomposition of the acid, and the rapidity with which it communicates oxygen to the alcohol. Their mutual action, in consequence of this, become extremely violent, and it is difficult to add the requisite proportion of nitric acid to form ether, or to do so at least without considerable waste in the dissipation of elastic products. Different arrangements have been contrived to facilitate this, but probably none that can be conducted more easily than that now received into the

Dublin Pharmacopœia, originally contrived by Wolf, and found by Pelletier to succeed better than any other. The addition of the mixture of sulphuric acid and alcohol should be made in small quantities at a time, not exceeding two ounces, and the quantity of product is increased by keeping the first receiver cool, and connecting with it not merely one bottle, but a range of bottles, containing, according to a method employed by Thenard, a saturated solution of muriate of soda, kept cool by ice, through which the elastic product is transmitted; it is condensed, and the liquid floats on the surface.

The theory of the formation of nitric ether remains obscure; the series of changes, however, are obviously different from those which take place in the production of sulphuric ether. The acid is entirely decomposed, or nearly so, scarcely any trace of it having been found by Pelletier in either the distilled or the residual liquor; there is no precipitation of carbonaceous matter from the alcohol, the liquor remaining transparent, and of a light yellow colour; and it contains oxalic and acetic acids, much diluted with water. Thenard, in his researches on this subject, found that the elastic fluid disengaged during the process, consists of nitrogen, nitric and nitrous oxide, and carbonic acid gases, holding dissolved ether, and a portion of acid partly nitrous, partly acetic. The nitric ether, which is condensed, has also combined with it nitric and acetic acids; and when these are abstracted so that it has no sensible acidity, it acquires this merely on keeping,—a proof that the elements of these acids exist in its composition. From the products obtained from its decomposition by transmitting it through an ignited tube, he infers, that 100 parts of it consist of 14.49 of nitrogen, 28.65 of carbon, 48.52 of oxygen, and 8.54 of hydrogen. In its formation, much of the oxygen of the acid appears to combine with the hydrogen of the alcohol, forming water; a portion of it unites with part of the carbon, forming carbonic acid, and with portions both of carbon and hydrogen, producing acetic acid; a considerable part of the nitrogen of the acid is disengaged in its insulated state, or in the form of nitric and nitrous oxides, and the remaining oxygen and nitrogen combine with the remaining carbon and hydrogen, and form the nitric ether.

Nitric ether is light and highly volatile; its colour is usualy yellow, probably from the presence of a portion of free nitric acid surcharged with nitric oxide; its odour is strong and penetrating, though not so fragrant as that of sulphuric ether; when pure and concentrated its volatility is such, that it instantly evaporates when poured from a phial, and boils at 70° under the common atmospheric pressure; it is highly inflammable: with alcohol it combines in every proportion, but in water it is soluble only in limited quantity, requiring, according to Thenard, when pure, 50 parts for its solution.

This ether has scarcely in its pure form been applied to any medicinal use; though it not improbably is possessed of powers analogous to those of sulphuric ether.

Spiritus Ætheris Nitrosi. Spirit of Nitrous Ether. Ed.

"Take of Strong Alcohol, three pounds; Nitrous Acid, one pound. Pour the alcohol into a large phial placed in a vessel full of cold water, and add the acid gradually, agitating them frequently. Close the phial lightly, and set it aside for seven days in a cool place; then distil the liquor with the heat of boiling water into a receiver kept cold with water or snow, until about three pounds come over."

Spiritus Ætheris Nitrici. Spirit of Nitric Ether. Lond.

"Take of Rectified Spirit, two pints; Nitric Acid, by weight, three ounces. Add the acid gradually to the spirit, and mix them, taking care that the temperature shall not rise higher than 120°; then with a gentle heat distil twenty-six fluidounces."

Spiritus Ætherеus Nitrosus. Nitrous Ethereal Spirit. Dub.

"Add to what remains after the distillation of Nitrous Ether, the Rectified Spirit of Wine which had been employed in the process to condense the elastic vapour, and distil with the highest heat of a water-bath, to dryness. Mix this distilled liquid with the alkaline solution remaining after the separation of the nitrous ether, and add also as much dry sub-carbonate of potash as shall be sufficient to neutralize the free acid, ascertaining this by the test of litmus. Lastly, distil this with the mean heat of a water-bath while any liquid comes over. The specific gravity of the distilled spirit is to that of distilled water as 880 to 1000."

A preparation similar to that of the Edinburgh Pharmacopœia, has long been employed in medicine. It consists probably of nitric ether diluted with alcohol, and contains always a portion of free acid. It is not difficult to add the nitric acid to the alcohol in the proportion of one to three parts, at least from this quantity of acid added with precaution, no violent action results. If heat were applied to this mixture, however, so as to raise it to 212°, a mutual decomposition, attended with the rapid extrication of elastic products, would take place. The heat must therefore be either applied very slowly, or the method ordered by the Edinburgh College must be followed, that of allowing the mixture to stand for some days in a cool place. During this time a mutual action is exerted between the acid and alcohol; the former is partially decomposed, and the heat required for distillation can be safely applied. That this decomposition takes place is proved by the experiments of Bayen. He digested an ounce of nitrous acid with two ounces of alcohol for five weeks; the liquor then required for its saturation only 134 grains of an alkaline base, while an ounce of the same acid required to saturate it 282 grains of the same base. And when, after digesting the acid and alcohol together, he submitted them to distillation, on mingling the product and the residual liquor, the whole was capable of neutralizing only 32 grains. By this reciprocal action of the acid and alcohol, a portion of nitric ether has been supposed to be formed, which distils over with a portion of unchanged alcohol, and of free acid. —This, however, is not altogether certain. The acid is so much diluted by the large proportion of alcohol, that it does not act on it with the same force; and the product is different in its qualities from nitric ether, being in particular more fragrant. Still it appears, that the series of changes are somewhat similar, the nitric acid being in part decomposed, and oxalic and acetic acids formed. The propriety of the change which has been made by the London College, that of diminishing so much the proportion of nitric acid, may be questioned, both as less nitric ether must be formed when the proportion of acid is so small, and as a considerable share of the medicinal preparation depends on the free acid.

The formula of the Dublin College must give a preparation different from the others, particularly in containing no free acid. The residual liquor which is ordered to be employed, must contain a portion of nitric acid; and the alcohol which has been employed to condense the elastic fluid of the first distillation, and which is submitted to the action of this re-

sidual liquor, probably contains a portion of nitric ether: by the farther action exerted between them a product will probably be formed somewhat analogous to that obtained by the preceding processes. But by the action of the alkali, to which it is afterwards submitted, its acidity must be removed, and to a certain extent this must modify its medicinal powers. The product of the process which has been generally followed, that of the Edinburgh Pharmacopœia, the powers of which are sufficiently ascertained, and its use established in practice, is probably that which ought to be preferred.

Spirit of nitric ether has an odour extremely fragrant; its taste is pungent and acidulous; it is volatile and inflammable, soluble readily both in alcohol and in water. It is employed principally as a grateful refrigerant in inflamatory affections, as a diuretic in dropsy, or rather as an auxiliary to promote the operation of more powerful diuretics, and as a stimulant relieving nausea and flatulence. Its dose is 30 or 40 drops, taken in a cupful of water.

CHAP. XVII.

EXTRACTA.—EXTRACTS.

Extracts are preparations obtained by digesting or boiling vegetable substances in water, alcohol, or proof spirit. The menstruum dissolves the active matter of the vegetable; the tincture or decoction is strained, and is evaporated until a mass of a stiff consistence is obtained. This is named an Extract; and is either an aqueous or spiritous extract, as water or alcohol has been employed as the menstruum. If water has been used, the mucilage, extract, tannin, saccharine, and saline parts of the vegetable remain in the extract; if alcohol, the resin is its principal component part; and if proof-spirit has been employed, all the fixed principles which water and alcohol are separately capable of dissolving, are obtained.

It is evident, therefore, that the same mode of preparing these extracts is not applicable to every vegetable substance. Where the virtues depend principally on the extract or tannin which the substance contains, the watery extract will be proper; while, if it depend on a resinous part, the spiritous extract only will possess its virtues.

It is to be observed, however, that in the preparation of these extracts, the virtues of the substances are almost always injured to a certain extent. The essential oil, on which their flavour and aromatic quality depend, is dissipated; and in the preparation of the watery extracts, there is generally a partial decomposition of the active matter, by the necessary decoction, from oxygenation by the action of the air, or from the re-action of its elements, favoured by the humidity and temperature. This preparation, therefore, though it has the advantage of the active matter, being in small bulk, is liable to uncertainty; hence it is not now very frequently employed; and with the exception of some of the pure bitters, as gentian, or some of the saccharine vegetables, as liquorice, there is no medicine, perhaps, but what may be given with more advantage under some other form.

The Edinburgh and Dublin Colleges preserve the distinction of Watery

and Spiritous extracts: the London College do not observe it; and they have farther associated with what are more strictly named Extracts, the inspissated juices of vegetables, the consistence of these being similar; and the only circumstance in which they differ, that in the one the matter naturally dissolved in the juice of the plant, in the other the matter extracted by the operation of a solvent, is obtained by evaporation, is not, it has been conceived, sufficiently important to constitute a distinction between them. I have adhered, however, to the arrangement of the Edinburgh Pharmacopœia, and under the Chapter of Inspissated Juices have already introduced those preparations of this nature which are peculiar to the London Pharmacopœia.

Mr. Barry has lately taken a patent for a new mode of preparing extracts in vacuo. In this manner the empyreuma and the action of the air is completely avoided, while the extracts are said to be more powerful, and what is perhaps equally important, not so variable in their strength, as they are when prepared in the usual way.

I. Extracta per Aquam.—Extracts by Water. Ed. Extracta Simpliciora.—More simple Extracts. Dub.

The directions for preparing these are thus given in the Edinburgh Pharmacopœia.

"Pour on the root from which an Extract is to be obtained, cut and bruised, eight times it weight of Distilled Water. Boil to one half, and expressing it strongly, strain the liquor. Reduce the boiled liquor immediately to the consistence of thick honey, by evaporation in a bath of boiling water, saturated with muriate of soda."

The Dublin College give the following directions:

"The Simpler Extracts, unless it be otherwise ordered, are to be prepared according to the following formula:—Boil the vegetable matter in eight times it weight of water to the consumption of half the liquor; then express the liquor, and after the impurities have subsided, strain it; evaporate with a heat of from 200° to 212°, until it begin to thicken; lastly, inspissate it with a heat of from 100° to 200°, stirring frequently, until it attain a consistence fit for forming pills.

The directions in the London Pharmacopœia are in part given under the individual extracts, and partly under the following general formula:

"In preparing all Extracts, evaporate as quickly as possible, in a shallow open vessel by a water-bath, until the consistence be such as is fit for forming pills, and towards the end, stir constantly with a spatula. Sprinkle on all the softer extracts a little spirit of wine."

Extractum Anthemidis Nobilis ex floribus siccatis. Ed. Extractum Anthemidis. Lond. Extractum Florum Chamæmeli. Dub. Extract of Chamomile.

The bitterness of chamomile is rendered rather ungrateful in its infusion by the flavour of its essential oil. This is entirely dissipated by decoction, and the extract is therefore a pure and grateful bitter. It is scarcely applied, however, to any use; but it may be prescribed with advantage in dyspeptic affections, especially where there is an aversion to bitters, as it can be given in the form of a pill. Its dose is 10 or 15 grains.

The formula for preparing this and the five following extracts, according to the different Colleges, is given above in the general direction of the Pharmacopœias.

EXTRACTUM GENTIANÆ LUTEÆ, EX RADICE CONCISA ET CONTUSA. Extract of Gentian. Ed. Lond. Dub.

This extract is intensely bitter, the quality of bitterness appearing in general not to be injured by decoction or evaporation. It is sometimes used to form other medicines into pills, especially those with which it coincides in medicinal virtue.

EXTRACTUM HÆMATOXYLI CAMPECHIANI, EX LIGNO RASO. Ed. EXTRACTUM HÆMATOXYLI. Lond. EXTRACTUM SCOBIS HÆMATOXYLI. Dub. Extract of Logwood.

The astringency of the Logwood is obtained with no sensible injury in this extract. It has been proposed to be employed as an astringent, but has never been established in use. Its dose is from ten to twenty grains.

EXTRACTUM HELLEBORI NIGRI, EX RADICE CONTUSA. Ed. Dub. Extract of the Root of Black Hellebore.

This extract has been employed as a cathartic, principally in mania, and as emmenagogue in a dose from five to fifteen grains, but it is uncertain in strength. The spiritous extract which has a place in some of the foreign Pharmacopœias, is a more active preparation. It has been used as a hydragogue cathartic, and is the basis of Baccher's tonic pills, once highly celebrated in the treatment of dropsy.

EXTRACTUM PAPAVERIS SOMNIFERI, EX CAPSULIS CONTUSIS, SEMINIBUS EXEMPTIS. Ed. EXTRACTUM PAPAVERIS. Lond. Extract of Poppy.

This extract of the capsule of the poppy retains, to a certain extent, its narcotic quality, but usually so far weakened as to leave it uncertain in strength. It is therefore little used. The Syrup of Poppy is sometimes prepared from it, by dissolving a drachm of the extract in a pint of water, and boiling this with the due proportion of sugar.

EXTRACTUM RUTÆ GRAVEOLENTIS, EX HERBA. Ed. EXTRACTUM FOLIORUM RUTÆ Dub. Extract of the Leaves of Rue.

As any medicinal virtue belonging to rue resides in its essential oil, this extract must be an injudicious preparation. It has been given in amenorrhœa, in a dose of from ten to fifteen grains; but it has probably no power.

The following Watery Extracts have a place in the London, or the Dublin Pharmacopœia:

EXTRACTUM ALOES PURIFICATUM. Purified Extract of ALOES. Lond.

"Take of Socotorine Aloes in Powder, half a pound; Boiling Water, four pints. Macerate for three days with a gentle heat; then strain, and put aside, that the impurities may subside. Pour off the purified liquor, and evaporate until it attain a proper consistence."

The object of this preparation is principally to obtain an extract with less resin than is usually contained in aloes: this it has been affirmed, is equally powerful as a purgative, and is less stimulating and more grateful. Its dose is ten or fifteen grains.

EXTRACTUM CINCHONÆ. Extract of Cinchona. Lond. Dub.

"Take of Pale Peruvian Bark bruised, a pound; Water, a gallon. Boil to six pints, and strain the liquor while warm. In the same manner, boil it four times in the same quantity of water, and strain. Having mixed the liquors, evaporate until a proper consistence is attained."

This extract ought to be kept *Soft*, so as to be fit for forming pills, and *Hard*, so as to be reduced to powder." (These are the directions in the London Pharmacopœia, in the other they are essentially the same.)

The active matter of Peruvian Bark is of an extractive and resinous nature, and is more soluble in alcohol than in water. Water, however, when aided by heat, is capable of dissolving the greater part of it; and as a great part of the substance of the bark consists of inert ligneous matter, it might be supposed that some advantage is derived from thus separating the more active principles. During the boiling and evaporation, however, they suffer a chemical change, to a certain extent, analogous to that which takes place in several varieties of vegetable matter exposed in a humid state, and at an elevated temperature, to the action of the air, and the nature of which, so far as it has been determined, has been explained, (Vol. I. Page 28). Hence the extract obtained is not equal in efficacy to the quantity of bark from which it has been prepared, and its strength is uncertain. Its medium dose is ten grains, which is supposed equivalent to half a drachm of cinchona in substance.

Extractum Colocynthidis. Extract of Colocynth. Lond.

"Take of the Pulp of Colocynth, one pound; Water, a gallon. Boil to four pounds, and strain the liquor while warm; then reduce it by evaporation to the proper consistence."

The active matter of colocynth is so far dissolved by water, by decoction, that the extract has a cathartic quality. It is less powerful, and has been supposed to be less irritating than the pulp. Its dose is from six to ten grains.

Extractum Colocynthidis Compositum. Compound Extract of Colocynth. Lond.

"Take of the Pulp of Colocynth cut, six drachms; Socotorine Aloes in powder, an ounce and a half; Scammony in powder, half an ounce; Cardamom Seeds in powder, a drachm; Proof-spirit, one pound. Macerate the pulp of colocynth in the spirit, with a gentle heat, for four days. Strain the liquor, and add to it the aloes and scammony; then evaporate until it attain a proper consistence, and towards the end of the evaporation mix in the cardamom seeds."

Extractum Colocynthidis Compositum. Compound Extract of Colocynth. Dub.

"Take of the Pulp of Colocynth cut small, six drachms; Hepatic Aloes, an ounce and a half; Scammony, half an ounce; Cardamom Seeds husked, one drachm; Spanish Soap, softened to a glutinous consistence by warm water, three drachms; Warm Water, a pint. Digest the Colocynth in the water in a covered vessel with a moderate heat for four days; to the liquor pressed out and strained, add the aloes and scammony, separately reduced to powder; evaporate the mixture with a moderate heat to a consistence proper for making pills, adding towards the end of the evaporation, the soap jelly and the seeds in powder, and mixing the whole thoroughly together.

This is the officinal preparation which has long had a place in the Pharmacopœias, under the name of Extractum Catharticum. It is a combination of the more powerful cathartics; and as these operate more effectually, and with less irritation, when combined, than when one only in a large

dose is employed, the composition is well adapted for administration in cases where it is difficult to excite purging. It used formerly to be prepared by employing diluted alcohol as the solvent, not only of the colocynth, but also of the resinous substances, and evaporating the solution; the Dublin College introduced the variation of employing water, and adding the resinous substances in powder, with a quantity of soap; the London College adopted this, but in the edition before the last restored nearly the original formula, which they still retain, and is undoubtedly preferable. The extract is usually given in doses of from five to ten or fifteen grains, repeated at short intervals, until it produce purging. Its power may be safely promoted by adding a portion of calomel.

Extractum Glycirrhizæ. Extract of Liquorice. Lond.

"Take of Liquorice Root sliced, one pound; Boiling Water, a gallon. Macerate for twenty-four hours, then boil down to four pints, and strain the liquor while warm, and lastly, evaporate to a proper consistence."

Extractum Glycirrhizæ. Extract of Liquorice. Dub.

This is prepared according to the general formula already inserted.

The soluble matter of this root appears to be chiefly sugar and mucilage, and it suffers, therefore, little or no injury in this extraction of it by water, or in the subsequent evaporation. The extract is usually prepared on a large scale, and much of it is imported in this country. It is often, however, in an impure state. Purified by solution in water, straining and evaporation, or prepared with care from the root itself, and evaporated nearly to dryness, it forms the Refined Liquorice of the shops. Under this form it is in common use as a demulcent in catarrh. Sometimes it is taken to relieve acidity in the stomach.

Extractum Humuli. Extract of Hop. Lond.

"Take of Hops, four ounces; Water, a gallon. Boil to four pints, and strain the liquor while it is hot; then reduce it by evaporation to the proper consistence."

Hop has been introduced into practice as a narcotic, possessing also from its bitterness a degree of tonic power. The bitterness will be obtained in this extract; but it is probable that the narcotic power is impaired, and that in this property it will not be uniform in strength. The dose of this extract is from five to fifteen grains.

Extractum Opii. Extract of Opium. Lond.

"Take of Opium cut into pieces, half a pound; Water, three pints. Add to the opium a small quantity of the water, and macerate for twelve hours that it may become soft; then add gradually the remaining water; triturate until they are intimately mixed, and put aside that the impurities may subside; then strain the liquor, and evaporate it to the proper consistence."

Extractum Opii Aquosum. Watery Extract of Opium. Dub.

"Take of Opium, two ounces: Boiling Water, a pint Rub the opium with the water for ten minutes, and after a little time pour off the liquor; rub the remaining opium with an equal quantity of boiling water for the same time, and in like manner pour off the liquor; Repeat this a third time; then mix the liquors, and expose the mixture to the air in an open vessel for two days. Lastly, strain through linen, and by gentle evaporation form an extract."

Any process of this kind designed to purify opium is altogether superfluous, for the impurities of the opium of commerce are inconsiderable, and neither alter its powers nor add materially to its bulk. And if such processes are designed to correct any of the qualities of the opium, whence the unpleasant symptoms which sometimes follow from its administration are supposed to arise, they probably rest on inaccurate views of its operation. The active matter of opium is not entirely extracted by water; in the present process, therefore, the product must differ from crude opium, and it would require clinical experience more extensive and accurate than we yet have to ascertain its real powers. It must besides be altered, and rendered also uncertain in strength by the chemical change which it will suffer during the inspissation. Even when the active principles of the opium have been extracted by diluted alcohol, (the method which was formerly followed in the process of the Pharmacopœia,) though the solvent is more powerful, requires less heat for its evaporation, and counteracts to a certain extent the action of the air, the inspissated mass is found to be inferior in strength to opium in its unpurified state, and this must be still more the case in the present process, where water is only employed. It is a process, therefore, the propriety of which is extremely doubtful.

Extractum Sarsaparillæ. Extract of Sarsaparilla. Lond.

"Take of Sarsaparilla Root cut, a pound; Boiling Water, a gallon. Macerate for twenty-four hours, then boil to four pints, and strain the liquor while warm; lastly, reduce it by evaporation to the proper consistence."

Sarsaparilla being usually given under the form of watery decoction, there appears to be no particular advantage in preparing from this an extract, as the decoction may be brought to any state of concentration, by using an increased proportion of the root, or continuing the boiling for a longer time. And a watery mucilaginous extract as this is, besides the injury it will suffer in its inspissation, will farther be liable to spontaneous decomposition on keeping, and is therefore unfit for an officinal preparation.

Extractum Taraxaci. Extract of Dandelion. Lond. Dub.

"Take of the fresh Root of Dandelion bruised, a pound; Boiling Water, a gallon. Macerate for twenty-four hours, then boil to four pints, and strain the liquor while hot; lastly, evaporate it to the proper consistence."

The recent root of dandelion has been ranked as an aperient and diuretic. The expressed juice or decoction of the root has been employed as a remedy in dropsy, biliary obstructions, and induration of the liver; and, according to Bergius, has proved frequently successful where other remedies had failed. Whatever may be the powers of the plant, it may be doubted if the form of the watery extract be the best for its administration.

Extractum Valerianæ. Extract of Valerian. Dub.

"Take of Valerian Root in coarse powder, six ounces; Boiling Water, three pints. Digest for twenty-four hours in a close vessel with a moderate heat; press out the liquor, and reduce it to a proper consistence by evaporation."

The medicinal powers of valerian appear to be connected with the principle in which its odour resides, and as this must be in a great measure

dissipated by evaporation, it may be doubted if this is a form of preparation properly adapted. It can at least have no advantage over the extemporaneous infusion of decoction.

The following Watery Extracts, peculiar to the Dublin Pharmacopœia, are prepared according to the general formula already inserted.

Extractum Cacuminum Absinthii. Extract of the Tops of Wormwood. Dub.

This extract is intensely bitter, and the unpleasant odour of the plant is dissipated during the evaporation. It may be substituted for extract of gentian It is sometimes used, instead of hops, to give bitterness to fermented liquors.

Extractum Cacuminum Genistæ. Extract of broom-tops. Dub.

The infusion of the tops of the broom has a degree of diuretic power, whence it has been employed as a remedy in dropsy. The extract can scarcely be supposed to have much power, and it is now expunged from the Edinburgh Pharmacopœia, where it formerly had a place.

Extractum Radicis Jalapæ. Extract of Jalap Root. Dub.

The active matter of jalap is partly resinous, and must therefore be imperfectly extracted by water. The extract thus prepared may be milder than the root, but will be liable to be uncertain in strength. A resinous extract is prepared by the action of diluted alcohol which has a place in all the Pharmacopœias, and which must be a more active preparation, though neither of them can claim any peculiar advantage.

Extractum Corticis Quercus. Extract of Oak Bark. Dub.

In this extract the astringency of the oak bark will be obtained probably with little injury, and consisting principally of tannin, it will not be very liable to spontaneous decomposition. It can have scarcely any advantage, however, but what may be equally obtained from the decoction.

Extractum Foliorum Sabinæ. Extract of Leaves of Savin. Dub.

The medicinal powers of this herb seem in a great measure to depend on its essential oil, and as this must be dissipated during the evaporation, the extract must be comparatively an inactive preparation. It is never used.

II. Extracta per Aquam et Alcohol.—Extracts by Water and Alcohol. Ed.—Extracta Resinosa.—Resinous Extracts. Dub.

The directions for preparing these, in the Edinburgh Pharmacopœia, are as follows:

"Pour upon the substance in powder from which an extract is to be obtained, four times its weight of stronger alcohol. Digest for four days, and pour off the tincture. Boil the residuum in five pounds of distilled water for a quarter of an hour, and strain the decoction while hot through linen. Repeat this boiling and straining with an equal quantity of distilled water, and reduce the liquor by evaporation to the consistence of thin honey. Draw off the alcohol from the tincture by distillation, until it is reduced to a similar consistence. Then mix the liquors thus inspissated, and reduce to a proper consistence by evaporation in a bath of boiling water, saturated with muriate of soda."

In this manner are prepared,

EXTRACTUM CINCHONÆ LANCIFOLIÆ, EX CORTICE. Extract of Pale Bark.
EXTRACTUM CONVOLVULI JALAPÆ, EX RADICE. Extract of Jalap.

EXTRACTUM CINCHONÆ RESINOSUM. Resinous Extract of Bark. Lond.

"Take of Peruvian Bark bruised, a pound; Rectified Spirit, four pints. Macerate for four days, and strain. Let the tincture be distilled from a water-bath until it is of a proper consistence."

EXTRACTUM CINCHONÆ RUBRÆ RESINOSUM. Resinous Extract of Red Bark. Dub.

Is to be prepared in the same manner as the Resinous Extract of Cascarilla. (See p. 80.)

This preparation will probably be more active than the watery extract of bark already noticed. By the joint action of the alcohol and water, all the principles of the bark are extracted, and nothing remains but the inert ligneous fibre. And in the subsequent evaporation, the dissolved matter suffers less injury, partly from less heat being required to bring it to the due consistence, and partly perhaps from the alcohol resisting the oxygenation or decomposition of the extract. It is, however, much more expensive; and the extract of bark to be found in the shops is almost always that which is prepared by the other formula. The dose of the spiritous extract is ten grains; it affords a convenient vehicle for combining bark with the more active preparations of iron in the form of pill.

EXTRACTUM JALAPÆ. Extract of Jalap. Lond.

"Take of the Root of Jalap bruised, one pound; Rectified Spirit, four pints; Water, ten pints. Macerate the jalap root in the spirit for four days, and pour off the tincture. Boil the residuum with the water to two pints. Then strain the tincture and the decoction separately; evaporate the latter, and distil the former until each begin to become thick. Lastly, mix the extract with the resin, and evaporate to the proper consistence.

This extract is to be kept *soft*, so that it may be fit to form pills, and *hard*, that it may be rubbed into powder."

In the preparation of this extract, both the resinous and mucilaginous parts of the jalap root are dissolved, and it is therefore a more active preparation than the watery extract of jalap already noticed. It exerts its cathartic operation fully in a dose of ten or twelve grains, but it has no particular advantage, and is seldom employed.

EXTRACTUM RHEI. Extract of Rhubarb. Lond.

"Take of the Root Rhubarb bruised, one pound; Diluted Alcohol, a pint; Water, seven pints. Macerate for four days with a gentle heat, then strain and put aside the liquor, that the impurities may subside; pour it off when clear, and reduce it by evaporation to the proper consistence."

The purgative power of rhubarb is usually supposed to be more peculiarly extracted by water, and it may therefore be obtained by this process. It will equally be obtained, however, in the simple infusion, which, as being an extemporaneous preparation, is preferable to this extract, which, besides the change that may produced during the insipissation, must be farther liable to decomposition when kept in a soft state.

Besides these, there are other two spiritous extracts admitted by the Dublin College.

Extractum Cascarillæ Resinosum. Resinous Extract of Cascarilla. Dub.

"Take of Cascarilla Bark in coarse powder, a pound; Rectified Spirit of Wine, four pints. Digest for four days, then pour off the tincture, and strain. Boil the residuum of the cascarilla in ten pounds of water, to two pounds. Evaporate the strained decoction, and distil the tincture from a retort, until each become thick: then mix them together, and reduce them by evaporation to a consistence fit for forming pills; lastly, mix both extracts well together."

This extract may contain the active matter of the cascarilla, and may be given as a bitter and tonic, in the dose of a scruple; but there does not appear to be any propriety in employing this remedy under this expensive form.

Opium Purificatum. Purified Opium. Dub.

"Take of Opium cut into small pieces, one pound; Proof-spirit, twelve pints. Digest with a gentle heat, stirring frequently until the opium is dissolved; strain the tincture through paper, and distil from a retort, that the spirit may be separated; pour out the remaining liquor, and evaporate until the extract become of a proper consistence.

"Purified opium is to be kept in two states; one *soft*, so as to be fit for forming pills; the other *hard*, so as to be capable of being reduced to powder."

The objections to the purification of opium by the action of water, have been already stated. In the present process, as the power of the solvent is greater, and the degree of heat necessary to evaporate it less considerable, it is probable that the opium will suffer less change. Still we cannot be certain of its real power in this state, and the process is expensive, and altogether superfluous.

Gummi Resinæ. Gum-Resins. Lond.

"Separate Opium carefully from extraneous substances, especially on its external surface. Let it be kept in the state of Soft Opium fit for forming pills; and Hard Opium, rendered so by having been dried in the heat of a water-bath, so that it can be rubbed to powder.

"Those Gum-Resins are to be accounted of the best quality, which can be selected so pure, as to require no purification. If they appear to be less pure than this, boil them in water till they become soft, and press them by a press through an hempen bag; then put them aside, that the resinous part may subside. The liquor above being poured off, evaporate it by the heat of a water-bath, adding towards the end of the evaporation the resinous part, and mixing it thoroughly with the gummy part into one mass.

"Those Gum-Resins which melt easily may be purified by being put into an ox bladder, and kept in boiling water until they become soft, so that they may be separated from the impurities by being pressed through an hempen cloth.

"The Balsam of Storax is to be dissolved in rectified spirit, and strained; the spirit is then to be distilled with a gentle heat, until the balsam become of the proper consistence."

Styrax Purificata. Purified Storax. Dub.

"Digest Storax in water with a gentle heat, until it become soft; then

press it between iron plates heated by boiling water; and lastly, free it from the water."

These directions for the purification of GUM-RESINS, are the most proper perhaps that can be given; but they are omitted by the Edinburgh College, as it is always preferable to use them medicinally, only when in that state in which they do not require purification; for, however cautiously the operation may be performed, they are liable to suffer some change, either from the dissipation of volatile principle, or from changes of composition in those which are fixed The process is admissible, therefore, only with regard to gum-resins which are to be applied externally, as ammoniac or galbanum, when they are to form the basis of plasters. STORAX is a substance so rarely employed in medicine, that the ordering it to be purified is superfluous; and the process given by the Dublin College, though more economical than that of the London Pharmacopœia, must occasion some dissipation of its odorous matter, on which all its powers depend. The directions given by the London College with regard to OPIUM, though not very necessary, are preferable to a process formerly admitted, and which has been already noticed, as still retained in the Dublin Pharmacopœia, in which opium is dissolved in proof-spirit, and the tincture is strained, and again evaporated to the due consistence,—a process in which the opium always sustains a diminution of power.

CHAP. XVIII.

SPIRITUS STILLATITII.—DISTILLED SPIRITS.

ALCOHOL dissolves the essential oils of vegetables in much larger quantity than the water does, and it might therefore be supposed that it will be more strongly impregnated with them by distillation, and hence possess in a greater degree the aromatic flavour and pungency of the plant from which it is distilled. It is seldom, however, that this is the case; and from many vegetables alcohol acquires by distillation a weaker impregnation than water. This is owing to its greater volatility. All the essential oils are volatilized at a temperature of 212°, and must therefore rise with water in distillation, and impregnate it to the extent in which it can dissolve them. But there are many of them not volatilized at the temperature at which alcohol boils, and when it is distilled, therefore, from the plants containing such oils, it comes over weakly impregnated with their odour or pungency. To obviate this, diluted alcohol, or Proof-spirit as it is named, is employed in the distillation. It is macerated on the vegetable substance, and is then distilled; the alcohol rises first nearly pure, but as the distillation proceeds, the liquor requires a higher temperature to cause it to boil; the vapour therefore is more largely impregnated with the essential oil; towards the end of the distillation the whole of it is brought over with the last portion of water; and the spirit, which has previously been distilled, being mingled with this, forms a transparent solution. This forms a distilled spirit. There are at least only two officinal spirits in which pure alcohol is the solvent,—the spirit of lavender and spirit of rosemary, the essential oils of these plants being sufficiently volatile to be elevated at the temperature at which alcohol distils.

Distilled spirits are preparations of no great importance. Like the distilled waters, they serve as vehicles for the administration of more active medicines, the taste and flavour of which they cover or render more grateful; or they are occasionally employed as grateful stimulants, to relieve nausea or flatulence. The directions for preparing them are given in the Edinburgh Pharmacopœia under a general formula: it is as follows:

"Pour nine pounds of Diluted Alcohol over the substance to be distilled. Macerate during two days in a close vessel; then add a sufficient quantity of water to prevent empyreuma, and draw off nine pounds by distillation."

In the same manner are prepared the following spirits, nine pounds being drawn from the quantities affixed:

SPIRITUS CARI CARUI, EX SEMINUM CONTUSORUM LIBRA DIMIDIA. (Spirit of Caraway, from half a pound of the bruised seeds.)
SPIRITUS LAURI CINNAMOMI, EX CORTICIS CONTUSI LIBRA. (Spirit of Cinnamon, from a pound of the bruised bark.)
SPIRITUS MENTHÆ PIPERITÆ, EX HERBÆ UNA CUM SEMISSE. (Spirit of Peppermint from one pound and a half of the herb.)
SPIRITUS MYRISTICÆ MOSCHATÆ, EX NUCLEORUM CONTUSORUM UNCIIS DUABUS. (Spirit of Nutmeg, from two ounces of the bruised kernels.)
SPIRITUS MYRTI PIMENTÆ, EX FRUCTUS CONTUSI LIBRA DIMIDIA. Spirit of Pimento, from half a pound of the bruised fruit.)

To these may be added the following from the London Pharmacopœia:

SPIRITUS ANISI. Spirit of Anise.
SPIRITUS MENTHÆ VIRIDIS. Spirit of Spearmint.
SPIRITUS PULEGII. Spirit of Pennyroyal.

All these spirits have the aromatic flavour, and to a certain extent the pungency of the vegetables from which they are prepared, and any medicinal application of them is founded entirely on these qualities. They require, therefore, no particular observations.

Of Compound Spirits, the following have a place in the Pharmacopœias:

SPIRITUS JUNIPERI COMPOSITUS. Compound Spirit of Juniper. Ed.

"Take of Juniper Berries bruised, one pound; Fennel Seeds, Caraway Seeds, of each bruised, one ounce and a half; Diluted Alcohol, nine pounds. Macerate for two days; and having added as much water as is sufficient to prevent empyreuma, draw off nine pounds by distillation."

SPIRITUS JUNIPERI COMPOSITUS. Compound Spirit of Juniper. Lond.

"Take of Juniper Berries bruised, one pound; Caraway Seeds bruised, Fennel Seeds bruised, of each one ounce and a half; Proof-Spirit, a gallon; Water, as much as will prevent empyreuma. Macerate for twenty-four hours, and distil a gallon with a gentle heat."

SPIRITUS JUNIPERI COMPOSITUS. Compound Spirit of Juniper. Dub.

"Take of Juniper Berries bruised, one pound; Caraway Seeds bruised, Fennel Seeds bruised, of each an ounce and a half; Proof-Spirit, a gallon. Macerate for two days, then add as much water as will prevent empyreuma, and distil one gallon."

This is a grateful cordial spirit, which has been used as a carminative and as a stimulant and diuretic in dropsy.

SPIRITUS ANISI COMPOSITUS. Compound Spirit of Anise. Dub.

"Take of Anise Seeds, Angelica Seeds, of each bruised, half a pound;

Proof-Spirit, one gallon; Water as much as is sufficient to prevent empyreuma. Distil one gallon."

This is similar to the preceding spirit, milder, and perhaps less grateful. It has been used as a carminative.

There remain, lastly, those Distilled Spirits prepared with Pure Alcohol.

Spiritus Lavandulæ Spicæ. Spirit of Lavender. Ed. Lond.

"Take of Fresh Lavender Flowers, two pounds; Alcohol, eight pounds. Draw off seven pounds by distillation with the heat of a water-bath."

Spiritus Lavandulæ. Spirit of Lavender. Dub.

"Take of the Fresh Tops of Lavender, one pound and a half; Proof-spirit, one gallon; Water, as much as will prevent empyreuma. Distil off, by a moderate heat, five pints."

The Oil of Lavender is sufficiently volatile to be elevated with alcohol in vapour, and is completely dissolved by it. The spirit is used principally as a grateful stimulating perfume, which gives relief in headach, being drawn up the nostrils, or applied to the forehead.

Spiritus Lavandulæ Compositus. Compound Spirit of Lavender. Ed. Dub.

"Take of Spirit of Lavender, three pounds; Spirit of Rosemary, one pound; Cinnamon Bark bruised, one ounce; Cloves bruised, two drachms; Nutmeg bruised, half an ounce; Red Saunders Wood rasped, three drachms. Macerate seven days, and strain."

Spiritus Lavandulæ Compositus. Compound Spirit of Lavender. Lond.

"Take of Spirit of Lavender, three pints; Spirit of Rosemary, one pint; Cinnamon Bark bruised, Nutmegs bruised, of each half an ounce; Red Saunders Wood cut, one ounce. Macerate for fourteen days, and strain."

Spiritus Lavandulæ Compositus. Compound Spirit of Lavender. Dub.

"Take of Spirit of Lavender, three pints; Spirit of Rosemary, one pint; Cinnamon Bark bruised, Nutmegs bruised, of each half an ounce; Cloves, two drachms; Chippings of Red Saunders Wood, an ounce. Macerate for ten days, and strain."

This tincture is a grateful cordial and stimulant in common use for relieving languor and faintness. Its dose is thirty or forty drops, taken on a piece of sugar, or in a cupful of water.

Spiritus Rorismarini Officinalis. Ed. Spiritus Rosmarini. Lond. Spirit of Rosemary.

"Take of Fresh Rosemary Tops, two pounds; Strong Alcohol, eight pounds. Draw off seven pounds by distillation by the heat of boiling water."

Spiritus Rorismarini. Spirit of Rosemary. Dub.

"Take of Fresh Rosemary Tops, a pound and a half; Proof-spirit, a gallon. Distil five pints by a moderate heat."

Spirit of Rosemary is a very fragrant perfume, and is in common use for the same purposes as the simple Sprint of Lavender.

Spiritus Armoraciæ Compositus. Compound Spirit of Horse-Radish. Lond.

"Take of Fresh Horse-Radish root cut, Dried Orange Peel, of each one pound; Nutmegs bruised, half an ounce; Proof-spirit, a gallon; Wa-

ter, as much as is sufficient to prevent empyreuma. Macerate for twenty-four hours, then distil a gallon with a slow fire.—There was formerly in this composition two pounds of Fresh Scurvy Grass, which substance is still retained by the Dublin College."

Spiritus Raphani Compositus. Compound Spirit of Horse-Radish. Dub.

"Take of Fresh Horse-Radish Root, Dried Outer Rhind of Oranges, of each two pounds; Fresh Herb of Garden Scurvy Grass, four pounds; bruised Nutmegs, one ounce; Proof-spirit, two gallons; Water, as much as will prevent empyreuma. Draw off two gallons."

This compound spirit was once employed as an antiscorbutic. It has justly fallen into disuse.

Alcohol Fortius, Stronger Alcohol. Ed. Spiritus Rectificatus, Rectified Spirit. Lond. Spiritus Vinosus Rectificatus, Rectified Spirit of Wine. Dub.

There is no process given in the Edinburgh Pharmacopœia for the preparation of alcohol. It is supposed to be procured from those who prepare it on a large scale, and is inserted in the catalogue of the articles of the Materia Medica, as of the specific gravity .835, this being a strength at which it can be procured without difficulty, and being sufficient for nearly every purpose to which it requires to be applied in Pharmacy. It is procured of this strength from any of the spiritous liquors of commerce by slow distillation with a gentle heat, a portion of sub-carbonate of potash heated being previously added to abstract the water more effectually from the spirit. The product is submitted to a second distillation, a little alum being generally added previous to this, to remove any of the alkali which might be held in solution in the spirit obtained by the first distillation.

The London and Dublin Colleges, while they have also inserted alcohol of this strength, under the name of Rectified Spirit, in the catalogue of the articles of the Materica Medica, have given a process to obtain it more concentrated for particular purposes. The following are the directions in the London Pharmacopœia:—

"Take of Rectified Spirit, a gallon; Sub-carbonate of Potash, three pounds. To the spirit add a pound of the sub-carbonate of potash previously heated to 300°, and macerate for twenty-four hours, shaking frequently; then to the spirit poured off, add the remaining portion of the sub-carbonate of potash heated to the same degree; lastly, distil the alcohol from a water-bath, and keep it in a vessel well stopt. The specific gravity of alcohol is to that of distilled water as 815 to 1000."

The process in the Dublin Pharmacopœia is nearly the same:—

"Take of Rectified Spirit, a gallon; of Potashes dried by a heat of 300°, and warm, a pound; of Caustic Potash, an ounce; Muriate of Lime dry, half a pound. Mix the spirit and the Potash; add the potashes previously rubbed to powder, and digest the mixture in a close vessel for three days, agitating frequently. To the spirit poured ff, add the muriate of lime: distil with a gentle heat, until what remains begins to become thick. The specific gravity of the liquor is to that of distilled water as 815 to 1000. The muriate of lime may be conveniently obtained from the matter remaining in the distillation of water of ammonia."

The concentration of the alcohol in these processes is obtained by the action of substances which have a strong affinity to water,—the sub-carbonate of potash, and the muriate of lime; these attract it from the spirit,

and counteract its volatility so as to prevent it from rising in the distillation. The muriate of lime exerts this agency most powerfully; and by repeated distillation from it, alcohol has been brought to its highest state of concentration, its specific gravity being so low as .800 or .798, at the temperature of 60°. Lowitz obtained it so low as .791 at 68°, and then the alcohol must have been quite free from water, at least it was the purest that has ever been prepared. Alcohol, rectified so highly as is ordered by the London and Dublin Colleges, is required for very few Pharmaceutic processes; and hence, in the greater number of their officinal preparations, rectified spirit, that is, alcohol of the specific gravity of .835, is directed to be employed. This contains in one hundred parts nearly 10 of water, with 90 of alcohol of the specific gravity of .815; what proportion of water the latter contains, or what constitutes real alcohol free from water, is altogether unknown. The Proof-spirit of the Edinburgh College, formed from equal parts of rectified spirit and water, is of the specific gravity of .935. That of the London and Dublin Colleges is stated at .930, and will be obtained of this strength by mixing four parts by measure of rectified spirit with three parts of distilled water. It is more generally employed for Pharmaceutic purposes than even pure alcohol. The properties of alcohol as an agent in Pharmacy, and its medicinal applications, have been already enumerated.

CHAP. XIX.

AQUÆ STILLATITIÆ. ED.—AQUÆ DISTILLATÆ. LOND.—AQUÆ DISTILLATÆ. DUB.—DISTILLED WATERS.

Several of the principles of vegetable matter are so far volatile as to be elevated in vapour at the temperature of 212°; hence, when water is distilled from them, it is frequently impregnated with their taste and odour, and sometimes even with their more active powers. The odour, and frequently the pungency of plants, reside in their essential oil; and this being always volatile at this temperature, the aromatic plants, in which essential oil is most abundant, communicate these qualities to water distilled from them, a portion of the oil being retained in solution by the water. The acrid principle of some vegetables appears likewise to be so far volatile as to rise in distillation with water; and the prussic acid, in which the narcotic power of the bitter almond, cherry laurel, and similar plants resides, is also obtained by the same process: but these vegetables are comparatively few, and there are no officinal distilled waters having a place in the Pharmacopœias possessed of any important power; they are designed, from their flavour and agreeable pungency, to serve merely as vehicles for the exhibition of more active remedies, and all of them owe these qualities to the essential oil which they hold dissolved.

Vegetables are in general more proper for distillation in their recent state than after being dried, the water they afford being more grateful. They are therefore ordered in this state when they can be procured in it by the Edinburgh and Dublin Colleges. The London College, on the contrary, order them to be used dried, as they cannot be procured fresh at

all seasons of the year. When fresh, they in general impregnate sufficiently with their flavour and taste, three times their weight of water; when dry, double that quantity. As much must be employed as that a sufficient quantity of water shall remain in the still to prevent any part of the vegetable matter being scorched, and communicating empyreuma to the distilled water, the distillation being continued as long as the liquid that condenses has any taste or smell of the vegetable from which it is distilled. The flavour of the more delicate plants is injured by this operation; and these distilled waters are in general less grateful to the stomach than the infusions of the vegetable matter which yields them.

Distilled waters are liable to a peculiar species of decomposition. When long kept, they become mucilaginous, and at length quite viscid, and at the same time somewhat sour. According to Bucholz, this change occurs most readily in those distilled waters which contain little essential oil, and it is not dependent on the air, but takes place even more quickly when the water is kept in a closed than in an open vessel. It might be supposed to arise from the presence of a small portion of vegetable matter, besides essential oil held in solution by the water; but according to experiments quoted by Bucholz, it is owing to changes in the oil itself; distilled water, in which essential oil of peppermint, fennel, and other plants was dissolved, becoming mucilaginous, and losing their odour in a few weeks. The change of composition in the oil, it is possible, may be owing to the chemical action of the oxygen of the water. To counteract this change, and preserve distilled waters more effectually in a proper state, a small quantity of alcohol is ordered to be added to them. According to Bucholz, they ought also to be kept in vessels imperfectly closed.

Aqua Distillata. Distilled water. Ed. Lond. Dub.

"Distil water in clean vessels until about two-thirds have distilled over."—The same directions nearly are given in the other Pharmacopœias.

Water does not occur in nature perfectly pure, but has generally a sensible impregnation of saline and earthy matter. Spring water, which is purest, contains a little carbonate of lime, and muriates of lime and soda; river water contains sulphate and carbonate of lime, and muriate of soda; and well water, sulphate and carbonate of lime in larger quantity. For some purposes in Pharmacy, it is necessary to use water free from these substances, particularly in the solution of some earthy and metallic salts, several of which are decomposed by them, and if they are given in small doses, may, by such decompositions, be rendered nearly inert. In preparations, too, where much water is evaporated, as in the formation of extracts, it has been judged preferable to employ distilled water, as the residual matter of common water will remain mixed with the product of the process, and uselessly add to its bulk, or even in some cases produce in it some chemical change. It is for these purposes that distilled water is ordered in the Pharmacopœias; but except where the use of it is rendered necessary from these circumstances, it ought not to be employed, as from losing in the distillation much of the air that it holds loosely dissolved, it is always vapid and unpleasant. And when directed in Pharmaceutical processes, without discrimination, the direction is liable to be altogether neglected by the apothecary.

The process should be conducted with rather a gentle heat, and ought not to be continued longer than until two-thirds of the water have distilled,

as otherwise a minute portion of the saline matter might be brought over in the distillation. The first portion, too, that comes over is directed by the London and Dublin Colleges to be rejected.

The directions for the preparation of the Distilled Water of Plants are given in the Edinburgh Pharmacopœia under a general formula.

"Add as much water to the substance that is to be distilled, that when ten pounds have been drawn off by distillation, a sufficient quantity shall remain to prevent empyreuma. After due maceration, distil ten pounds."

In the London and Dublin Pharmacopœias, the water, after maceration on the vegetable matter, if it is dry, is directed to be distilled, allowing so much to remain in the still as will prevent empyreuma. And in all the Pharmacopœias, half an ounce of rectified spirit is ordered to be added to each pound of water after distillation.

Aqua Citri Aurantii, ex corticis recentis libris duabus. Water of Orange-Peel. Ed.—"Ten pounds of water are drawn from two pounds of fresh orange peel."

This distilled water has none of the bitterness of the orange-peel, but merely its flavour, and is so little used, that it is not kept in the shops.

Aqua Citri Medicæ. Water of Lemon-Peel. Ed.—

"Ten pounds of water are drawn from two pounds of the fresh rhind of the lemon."

This water has merely a slightly agreeable flavour, and is scarcely ever used.

Aqua Lauri Cassiæ, ex corticis contusi libra. Water of Cassia Bark. Ed.

Aqua Lauri Cinnamomi, ex corticis contusi libra. Ed. Lond. Dub.—

"Ten pounds or a gallon of water are distilled from a pound of each of these barks."

The cassia water, when not prepared too pungent, can scarcely, however, be distinguished from that of the cinnamon, the essential oil of both these barks have a flavour nearly the same. The cassia water, therefore, being less expensive than the cinnamon, is substituted for it in the shops. It has the pungency and aromatic flavour of the cassia, and is hence in common use to cover the ungrateful taste and flavour of other medicines, and not unfrequently is used in too large quantities. It is sometimes given alone as an aromatic and stimulant.

Aqua Menthæ Piperitæ, ex herbæ libris tribus. Peppermint Water. Ed. Lond. Dub.—"Ten pounds of water are drawn by distillation from three pounds (one pound and a half, Lond. Dub.) of green peppermint."

This water is strongly impregnated with the flavour of the herb, and is very frequently used in mixtures to cover the flavour of other medicines. It is also often taken alone as a carminative.

Aqua Menthæ Pulegii, ex herbæ libris tribus. Pennyroyal Water. Ed. Lond. Dub.—"Ten pounds of water are distilled from three pounds (one pound and a half, Lond. Dub.) of the green herb."

Pennyroyal water has a flavour and taste similar to that of peppermint, and is used for the same purposes, but it is rather less grateful.

Aqua Myrti Pimentæ, ex fructus contusi libra dimidia. Pimento Water. (Aq. Piment. Lond. Dub.)—"Ten pounds of water are distilled from half a pound of the Jamaica Pepper."

This water has the flavour of the Jamaica pepper, and its aromatic quality; but as this is not very grateful, it is not often used.

Aqua Rosæ Centifoliæ, ex petalorum recentium libris sex. (Rose Water, from six pounds of the fresh petals. Aq. Rosæ, Lond. Dub.) —"Ten pounds of water are drawn from six pounds (eight pounds, Lond.) of the fresh pale rose flowers."

This water has all the flavour of the rose, and as it has no pungency or acrimony, it is often used for external application, as in solutions of acetate of lead, or sulphate of zinc, for collyria.

There are a few Distilled Waters peculiar to the London or the Dublin Pharmacopœia, of so little importance, however, as to require scarcely more than enumeration.

Aqua Anethi. Distilled Water. Lond.—"A gallon of water is distilled from a pound of the seeds."

Its flavour is rather unpleasant, and it has little pungency.

Aqua Carui. Caraway Water. Lond.—"A gallon of water is distilled from a pound of the seeds.

This has a considerable share of aromatic flavour and pungency, and may be employed as a carminative.

Aqua Fœniculi. Fennel Water. Lond. Dub.—"A gallon of water is distilled from a pound of the seeds."

This has merely the weak flavour of the seeds, with little warmth.

Aqua Menthæ Viridis. Spearmint Water Lond. (Aq. Menth. Sativ. Dub.)—"A gallon of water is distilled from a pound and half of the herb."

Its flavour and taste are so similar to those of peppermint or pennyroyal, that it may be regarded as superfluous.

CHAP. XX.

OLEA VOLATILIA.—VOLATILE OILS.

Essential oil, as a proximate principle of vegetables, has already been considered, and its distinctive properties pointed out. As yielded by different vegetables, its chemical characters are nearly uniform: but the oils of different plants vary in their sensible qualities, particularly in those of colour, consistence, odour, and taste. Their odour is that of the plant from which they are procured; their taste also is frequently the same, particularly in those plants named aromatic, and it is always pungent and acrid: their colours are shades of yellow, green, and brown; they are usually liquid, but sometimes of a thick consistence.

In a few cases, these oils, existing in distinct vesicles, can be obtained by expression. Usually they are diffused through the vegetable matter, so

as to render this impracticable ; they are then obtained by distillation: the heat could not be applied, however, with sufficient uniformity, and within the due degree, to the vegetable matter alone : it is therefore distilled with a portion of water, not larger than what is necessary to avoid empyreuma at the end of the distillation. The oil is volatilized with the watery vapour ; and though a portion remains dissolved, yet from the sparing quantity of water employed, the greater part is collected apart, either according to its specific gravity floating on the surface, or having subsided to the bottom. In performing the operation in the large way, the same water is repeatedly put into the still, by which the loss from the oil being dissolved is in a great measure avoided. The product of oil is very different from different plants ; and the most odorous and pungent plants do not always afford the largest quantity, even where the oil is the principle in which the odour or pungency resides ;—the petals of the rose, for example, or the bark of cinnamon, affording a quantity extremely small, though in the one of these the oil has the entire flavour of the flower, and the other the aromatic warmth of the bark. The quantity and quality of the oil are also influenced by the circumstances of climate, soil and season ; the rich aromatic oils being generally more fragrant from the plant when growing in a warm climate and dry soil, than under the reverse of these ; and the oil afforded by the aromatic vegetables of this climate is in general stronger, and in larger quantity, in a dry than in a wet season. The oil at its first distillation has frequently an odour less grateful than after it has been kept for some time ; by age, however, its flavour is impaired. If the air has not been carefully excluded, it at length becomes thick ; some oils along with this change, deposite a little camphor, and others, when distilled anew, yield an oil similar to the original oil, a resinous substance being left.

The essential oils of commerce are somtimes adulterated, either by the addition of a cheaper oil, as that of turpentine, of an expressed oil, or of alcohol. These frauds are easily detected,—the first, by the smell, which is perceptible when the adulterated oil is dropt on paper, and heated so far as to be volatilized ; the second, by the oil forming a greasy spot when it is dropt on paper, which remains so even after heat has been applied ; the third by the oil, when dropt on water, forming a milky instead of a transparent film on the surface of the water.

Essential oils are seldom employed to answer any important indication in medicine, having scarcely any other powers than those of aromatic warmth and pungency. If used alone to relieve flatulence or nausea, they may be diffused in water by the medium of mucilage and sugar, or they may be dissolved in alcohol, and the solution diluted with water. More generally they are employed as corrigents, to improve the taste and flavour of ungrateful medicines, to cause these to sit easier on the stomach, or to obviate nausea, or any unpleasant symptom they may be liable to produce.

The following general rules with regard to the preparation of these oils are given in the Edinburgh Pharmacopœia :

" A sufficient quantity of water is to be thrown on the substance to be acted on, so as to prevent empyreuma during the distillation. After a proper maceration let the distillation be made, and then separate the oil from the water.

" It is also to be observed with regard to the preparation of distilled waters and oils, that according to the quality of the substances, their tex-

ture, the season of the year, and similar circumstances, so many differences must arise, that it is scarcely possible to give any certain and general rules which shall apply strictly to every example. Many things therefore are omitted, to be regulated according to the judgment of the operator, the most general directions only being delivered."

The following general formula is given in the London Pharmacopœia:

OLEA DISTILLATA. Distilled Oils. Lond.

"The Seeds of Anise and Caraway, the Flowers of Chamomile and Lavender, the Berries of Juniper and All-spice, the Tops of Rosemary, and the entire Plants of all other articles, dried, are to be employed. Put the substance from which the oil is to be distilled into an alembic, adding as much water as will cover it, and distil the oil into a large refrigeratory."

OLEA ESSENTIALIA. Essential Oils. Dub.

"Let the oil be drawn by distillation from the substance previously macerated in water, having added as much water as may prevent empyreuma."

In both Pharmacopœias, it is added, that the water which is produced in the distillation of the oils of caraway, peppermint, spearmint, pennyroyal, pimento, and sweet fennel, may be preserved for use. It is always the practice in the shops to preserve the water distilled from the plant, as it is sufficiently impregnated with the flavour and taste. It is liable, however, when it has been repeatedly distilled, which is the common practice, to avoid the waste of oil, to be rendered less grateful, than when only once distilled.

The following oils have a place in the Pharmacopœias, and are prepared according to the general directions, as given above:

OLEUM VOLATILE ANTHEMIDIS NOBILIS, EX FLORIBUS. Ed.—OLEUM DISTILLATUM ANTHEMIDIS. Lond.

This oil has an unpleasant flavour, and is scarcely ever used, although it has been said to be sometimes beneficial in cramp of the stomach. Dose five to ten minims.

OLEUM VOLATILE JUNIPERI COMMUNIS, EX BACCIS CONTUSIS. Ed.—OLEUM JUNIPERI. Lond.—OLEUM BACCARUM JUNIPERI. Dub. Volatile Oil of Juniper, from the bruised Berries.

When genuine, this oil has the flavour of the juniper berries, and is soluble in alcohol. There is generally substituted for it in the shops an oil distilled from some species of turpentine much less grateful, which alcohol does not dissolve. The genuine oil is diuretic, and it communicates this property to ardent spirit. Dose three to ten minims, dissolved in water by means of mucilage.

OLEUM VOLATILE JUNIPERI SABINÆ, EX FOLIIS. Ed.—OLEUM FOLIORUM SABINÆ. Dub. Oil of Savine, from the Leaves.

This plant yields more essential oil than any other does, two pounds affording not less than five ounces. The virtues of the savine seem also to depend on it, as the essential oil is said to be a powerful emmenagogue, in a dose from three to ten drops. It is however very little used.

OLEUM VOLATILE LAVANDULÆ SPICÆ, EX FLORIBUS. Ed.—OLEUM LAVANDULÆ. Lond.—OLEUM FLORUM LAVANDULÆ. Dub. Oil of Lavender, from the Flowers.

This oil is used principally on account of its flavour, sometimes also as a stimulant. Dose two to six minims.

OLEUM VOLATILE LAURI SASSAFRAS, EX RADICE CONTUSA. Ed.—OLEUM CORTICIS ET LIGNI SASSAFRAS. Dub. Volatile oil of Sassafras, from the Root, Bark, and Wood.

This is the heaviest of the essential oils; its odour is somewhat fragrant, and its taste warm, but it has no quality that renders it of much value.

OLEUM VOLATILE MENTHÆ PIPERITÆ, EX HERBA. Ed.—OLEUM MENTHÆ PIPERITÆ. Lond —OLEUM HERBÆ FLORESCENTIS MENTHÆ PIPERITIDIS. Dub. Oil of Peppermint. from the Herb.

This is one of the most pungent of the essential oils, and at the same time it excites a peculiar sensation of coolness in the mouth. It is a common and convenient remedy to relieve flatulence and anorexia, under the form of the Peppermint Lozenge, and also of what is named Essence of Peppermint,—a solution of one part of the oil in seven parts of alcohol; the dose of this being fifteen or twenty drops in a cupful of water.

OLEUM VOLATILE MYRTI PIMENTÆ, EX FRUCTU CONTUSO. Ed.—OLEUM PIMENTÆ. Lond.—OLEUM BACCARUM PIMENTÆ. Dub. Oil of Pimento, from the bruised Fruit.

This oil having the flavour of Jamaica pepper, is sometimes used on account of this flavour.

OLEUM VOLATILE ORIGANI MAJORANÆ, EX HERBA. Ed.—OLEUM ORIGANI. Lond —OLEUM HERBÆ FLORESCENTES ORIGANI. Dub. Oil of Marjoram.

This is sometimes used as a perfume, though less grateful than the oil of lavender. It is sometimes given to allay the pain of toothach, which is done by putting three or four drops, on a piece of cotton, in the tooth that is affected.

OLEUM VOLATILE PIMPINELLÆ ANISI, EX SEMINIBUS. Ed.—OLEUM ANISI. Lond.—OLEUM SEMINUM ANISI. Dub. Oil of Anise Seed.

This oil is of a light colour, and has rather an unpleasant smell. It congeals even at a very moderately cold temperature. It has less pungency than any of the other essential oils, and is therefore well adapted to the purpose to which it is usually applied, that of relieving flatulence and the symptoms arising from it in children, a little of it being rubbed with sugar and mixed with the child's food. The common proportion is ten or fifteen drops of the oil to two ounces of sugar.

OLEUM VOLATILE RORISMARINI OFFICINALIS, EX CACUMINIBUS. Ed.—OLEUM RORISMARINI. Lond.—OLEUM HERBÆ FLORESCENTES RORISMARINI. Dub. Oil of Rosemary, from the Tops.

The odour of this oil is less grateful than when it is diluted with alcohol in the form of Spirit of Rosemary. It is sometimes used in ointment as a perfume, and it enters as a stimulant into the composition of the soap liniment.

OLEUM CARUI. Oil of Caraway. Lond. Dub.

This is one of the most grateful of the essential oils, and is well adapted to act as a carminative, or to communicate an agreeable pungency, and cover the flavour of unpleasant remedies. It is therefore not unfrequently used.

OLEUM MENTHÆ VIRIDIS. Oil of Spearmint. Lond. Dub.

The flavour of this oil is similar to that of peppermint, rather less grateful, and its taste is less pungent.

Oleum Pulegii. Lond.—Oleum Herbæ Florescentis Pugelii. Dub. Oil of Pennyroyal.

This oil resembles the oil of peppermint and spearmint, and may be regarded as superfluous.

Oleum Seminum Fœniculi Dulcis. Oil of Sweet Fennel. Dub.

The flavour of this oil is similar to that of anise, and its qualities are so unimportant that it is never used.

Oleum Herbæ Florescentis Rutæ. Oil of Rue. Dub.

The flavour of oil of rue is ungrateful, and though it has been regarded as an emmenagogue, it is altogether discarded from use.

Along with the Volatile Oils are inserted some analogous preparations in the Pharmacopœias.

Oleum Succini et Acidum Succinicum. Oil of Amber, and Acid of Amber. Ed.

"Take of Amber in powder, Pure Sand, equal parts. Put them mixed together into a glass retort, of which they shall fill one half. Having adapted a large receiver, distil from a sand-bath, with a fire gradually raised. First, a watery liquor with a little yellow oil will distil over; then a yellow oil with an acid salt; afterwards, a reddish and black oil. Pour the liquor out of the receiver, and let the oil be separated from the water. Let the acid salt, collected from the neck of the retort and the sides of the receiver, be pressed between folds of bibulous paper, and freed from the adhering oil. Then purify it by solution in hot water and crystallization."

Oleum Succini Purissimum. Purified Oil of Amber.

"Distil Oil of Amber mixed with six times its weight of Water, from a glass retort, until two-thirds of the water have passed into the receiver. Then separate this purified volatile oil from the water, and keep it in vessels well stopped."

Acidum Succinicum. Succinic Acid. Dub.

"Take of Amber, Pure Sand, of each a pound. Distil with a heat gradually raised an acid liquor, oil, and salt contaminated with oil. Having removed the salt into bibulous paper, submit it to pressure to force out the oil; then sublime it."

Oleum Succini Rectificatum. Rectified Oil of Amber. Dub.

"Take of the Oil which rises in the preparation of Succinic Acid, a pound; Water, six pints. Distil until two-thirds of the water pass into the receiver, then separate the oil."

Oleum Succini. Oil of Amber. Lond.

"Put Amber into an alembic, and distil from a sand-bath, with a heat gradually raised, an acid liquor, oil, and salt contaminated with oil. Then distil again, and also for a third time, the oil."

Amber is a bituminous substance found in layers of bituminated wood, or in fragments or masses on the seashore in different countries; its origin or natural formation is not well ascertained. It is also possessed of peculiar characters; for although it approaches to the vegetable resins in a number of its properties, it differs in others, and differs remarkably in the products it affords when decomposed by heat. These products are an acid,

which being procured from no other substance, derives from this bitumen the name of Succinic Acid; and a peculiar empyreumatic oil. The process is conducted according to the directions given in the Pharmacopœias. The heat requires to be raised gradually, and the interposition of the sand is useful by dividing the particles of amber, and preventing it, when it melts, from swelling up and passing over into the receiver.

The succinic acid is in part dissolved by the water which condenses in the receiver, but the greater part is condensed in the form of a crust. When purified from the adhering oil, it is obtained in minute crystals, which are rhomboidal plates, of a brownish colour from a little oil still adhering to them; they are rather sparingly soluble in water, requiring 24 parts at 60° for their solution: the taste of this acid is penetrating and slightly sour; it reddens the vegetable colours, is soluble in alcohol, and is volatile and inflammable. In medicine it has been regarded as an antispasmodic and diuretic; but it appears to be wholly inactive, and is altogether discarded from practice.

The oil of amber procured by the first distillation is thick, of a dark-brown colour, and a very fœtid smell; by successive distillations it is obtained of a thinner consistence and lighter colour, and it can at length be rendered nearly limpid. Its smell still remains, however, peculiar and ungrateful; its taste is hot and acrid; it is volatile and inflammable, insoluble in water, and sparingly soluble in alcohol. In medical practice it has been celebrated as a stimulant and antispasmodic, and has been given in amenorrhœa and hysteria, in a dose of from 10 to 15 drops. Its internal administration is, however, entirely relinquished. Externally it is sometimes applied by friction as a stimulant in paralysis, and to relieve the pain of cramp and rheumatism; also as a stimulant and rubefacient in hooping cough; but its strong unpleasant smell renders the application extremely disagreeable.

Oleum Volatile Pini Purissimum. Rectified Oil of Turpentine. Ed.

"Take of Oil of Turpentine, one part; Water, four parts. Distil as long as any oil passes over."

Oleum Terebinthinæ Rectificatum. Rectified Oil of Turpentine. Lond.

"Take of Oil of Turpentine, a pint; Water, four pints. Distil the oil."

Oleum Terebinthinæ. Oil of Turpentine. Dub.

"Take of common Turpentine, five pounds; Water, four pints. Distil the oil from a copper alembic. Yellow resin will remain after the distillation."

Oleum Terebinthinæ Rectificatum. Rectified Oil of Turpentine. Dub.

"Take of Oil of Turpentine, two pints; Water, four pints. Distil a pint and a half of the oil."

The oil of turpentine of commerce is obtained by distillation from what is named Common Turpentine, the juice of the *Pinus Larix*, or sometimes from the wood of the tree. It appears to hold dissolved a small portion of resinous matter, as when again distilled it leaves a little of a thick residuum, and the rectified oil has been said to be more volatile than previous to this distillation. The process, however, is difficult to perform from the great volatility of the oil, and the diffusibility and inflammability of its vapour; it is one, too, which is nearly superfluous, the common oil being sufficiently pure for any purpose to which it requires to be applied

in medicine or pharmacy, and it is accordingly never attended to in the shops. The medicinal properties of this oil have been already considered.

Oleum Cornu Cervini Rectificatum. Rectified Oil of Hartshorn. Dub.

"Take of the Oil which rises in the distillation of the volatile liquor of Hartshorn, three pounds; Water, six pints. Distil the oil, and again distil the distilled oil frequently from water until it become limpid. It must be kept in a dark place, and in small phials quite filled with it, closely stopt."

Animal substances submitted to heat suffer decomposition, their elements entering into new combinations; one of the principal products of these decompositions is empyreumatic oil, formed from the combination chiefly of portions of the hydrogen and carbon of the animal matter. This product is obtained abundantly in the decomposition of bone or horn by heat, along with the carbonate of ammonia formed in the same process. The oil is at first thick, of a dark-brown colour, and offensive odour; but by repeated distillations from water it is rendered thinner more limpid, and less offensive. In its rectified state it has been celebrated as a stimulant and antispasmodic, but it is altogether discarded from modern practice.

CHAP. XXI.

SALINA.—SALINE SUBSTANCES.

The term Salt has long been employed, in chemical language, to denote an extensive order of substances; yet it is difficult to assign to it a precise definition. It is from a combination of the following properties, however, that the definition has been attempted to be formed.

Salts are said to be bodies eminently sapid, or which excite a strong penetrating taste when applied to the tongue. Many of them have indeed this power, but there are others, particularly among the earthy salts, in which any degree of sapidity is scarcely perceptible, while there are many bodies highly which are not of a saline nature.

2d, All salts are supposed to be soluble in water, and this, strictly speaking, is perhaps true; but in many of them, the degree of solubility is so inconsiderable, that it cannot be assigned as a distinctive character of the order; and there are substances ranked as salts which are nearly altogether insoluble.

3d, Salts are said to be capable of assuming a crystalline form. When dissolved in water, many of them, on evaporation of part of the water, concrete into regular crystals. But there are others which, either from being sparingly soluble in that fluid, or from having a strong attraction to it, cannot be easily made to crystallize; while there are substances crystallizable from their watery solution, sugar, for example, not saline.

4th, Salts are said to be fusible by the application of heat. But the same character may be assigned to almost every other substance which heat does not decompose; and there are many salts, which, instead of being fused are decomposed in a high temperature.

Lastly, Salts have been considered as inflammable; and many of them

must be so, as they are formed of substances already saturated with oxygen; but there are others, as ammonia and the vegetable acids, as well as the compounds of these, which are more or less inflammable; some of them even burn with a bright flame

It is evident, therefore, that those properties which have been assigned as characteristic of the order, are not possessed by every substance which, in chemical arrangements, is regarded as saline. Neither are they possessed exclusively by these substances; there being bodies not saline which are sapid, soluble in water, fusible by heat, uninflammable, and which have even a tendency to assume a crystalline form.

The characters of this order are, therefore, rather drawn from the chemical composition of the substances arranged under it. It is understood as comprehending the acids, the alkalis, and the compounds of the acids with alkalis, earths, and metallic oxides. The acids and alkalis are named Simple or Primary Salts; the others Secondary, or Neutral Salts, as in general the properties of the acid, and of the alkali, earth, or metal of which they are formed, are neutralized. These are the substances comprized under the present chapter, with a few associated with them for convenience, though not strictly connected with them. They are, generally speaking, important preparations; but differing widely in chemical constitution and medicinal powers, they admit of no general observation.

Acidum Aceticum Tenue. Weak Acetic Acid. Ed.

"Distil eight pounds of Vinegar with a gentle heat in glass vessels. The pound that comes over first is to be rejected as too watery, the five pounds that follow will be the Weak Acetic Acid. The distillation is to be continued as long as a colourless acid comes over; but as it is too much burnt, and not suited for internal use, it may be mixed with the first pound, and be employed for various chemical purposes."

Acidum Aceticum. Acetic Acid. Lond.

"Take of Vinegar, a gallon. Distil the acetic acid in a sand-bath, from a glass retort into a glass receiver kept cold; the first pint being rejected, keep the six pints that are next distilled."

Acetum Distillatum. Distilled Vinegar. Dub.

"Take of Wine Vinegar, two pints. Distil six pints with a gentle heat, employing glass vessels in the distillation, and rejecting the first pint which comes over.

"The specific gravity of this acid is to that of distilled water as 1006 to 1000."

Vinegar consists of acetic acid, largely diluted with water, and mixed with tartaric acid, extractive, glutinous and saccharine matter. From these it is purified by distillation, at least it retains in combination only a very small portion of extractive matter. The distilled liquor is however weaker than the vinegar itself, a larger portion of the acid remaining in the residual liquor; and, in general, it receives from the distillation somewhat of an empyreumatic odour. It is usual, on the large scale, to perform the distillation in a tin still, connected with a tin spiral tube in a refrigeratory, and to add portions of boiling water during the distillation, so as to dilute the residual liquor, and bring over the whole of the acid. The process, however, ought to be conducted in glass vessels, as directed in the Pharmacopœias; as, from metallic ones, (tin, which has been employed, being often alloyed with lead), the acid may receive an impregnation that might prove noxious: the conducting the distillation so as to obtain a larger

quantity of the acid than is ordered by the College may be allowed. It appears from Mr. Phillips' experiments, that the process as given by the Colleges is attended with an unnecessary waste: even the first eighth part ordered by the London College to be rejected has a sensible degree of acidity, a fluidounce of it decomposing from $4\frac{1}{2}$ to 5 grains of carbonate of lime. And this loss is without any adequate advantage, as distilled vinegar is not applied to any use in which it is of importance that it should be of great strength.

Distilled vinegar is colourless; it is not very sour to the taste; its colour is usually slightly empyreumatic. One fluidounce should dissolve thirteen grains eight-tenths of the carbonate of lime. Its specific gravity varies from 1.007 to 1.0095. It is chiefly employed as a solvent of some vegetable substances, and in making some of the salts. Sometimes it is applied externally, in preference to common vinegar, as a discutient, and as an application to burns. It has the advantage, as a pharmaceutic agent, not only of greater purity, but of not being liable, like undistilled vinegar, to spontaneous decomposition.

Acidum Aceticum Forte. Strong Acetic Acid. Ed.

"Take of Dried Sulphate of Iron, one pound; Acetate of Lead, ten ounces. Rub them together. Put them into a retort, and distil from sand with a moderate fire, as long as any acid comes over.

Acidum Aceticum. Acetic Acid. Dub.

"Take of Acetate of potash, six ounces; Sulphuric Acid, three ounces. Put the acid into a tubulated retort, and add to it gradually, and in different portions, the acetate of potash, allowing the mixture to cool after every addition; then distil the acid with a moderate heat, until the residuum is dry. The specific gravity of this acid is to that of distilled water as 1070 to 1000."

These are two processes for obtaining acetic acid in a concentrated state. Others have been likewise employed; one giving a stronger acid than either of them, has been long in use, and had a place in the former edition of the London Pharmacopœia. It consists in exposing verdigrease, which is a subacetate of copper, well dried, to a heat gradually raised, and purifying the acid which distils over by a second distillation; the high temperature in this process expelling the acetic acid from the metallic salt. In the first of the above processes, that of the Edinburgh Pharmacopœia, the expulsion of the acetic acid from the acetate of lead is favoured by the affinity exerted to the oxide of lead by the sulphuric acid of the sulphate of iron; and as these salts are dried, or contain little water of crystallization, the acid is supposed to be obtained in a concentrated state. In the process given by the Dublin College, the sulphuric acid combines with the potash of the acetate of potash, and disengages the acetic acid. This distils over; and as the acetate of potash contains little water, and the water of the sulphuric acid must be in part retained by the affinity exerted to it by the sulphate of potash, the acetic acid is obtained in a concentrated form.

Chemists had observed some difference of properties between acetic acid obtained from the decomposition of verdigrease by heat, radical vinegar as it was named, and the acid of vinegar purified by distillation and concentrated by freezing, or obtained in a concentrated state by the decomposition of an acetate having an alkaline or earthy base. They were therefore regarded as chemically different; the one, that obtained from the metallic salt, was believed to be more highly oxygenated, in consequence

of receiving oxygen from the metallic oxide, and was named Acetic Acid; while the other was named Acetous Acid. At a later period, it was supposed that they differed rather in the proportion of carbon existing in their base. But the experiments, first of Adet, and since of Darracq, have proved that they differ merely in degree of concentration, (that expelled from the metallic salt by heat being strongest), and sometimes in a small quantity of extractive matter adhering to the acid concentrated by freezing. When freed from this, and when brought to the same specific gravity by diluting the stronger, they have the same properties, display the same affinities, and afford the same products by analysis. There is therefore only one acid, the Acetic, and the name Acetous is not properly applied.

The process of the Edinburgh College affords an acid not so highly concentrated, and therefore not so pungent as that in which it is procured by exposing verdigrease to heat: it is also liable to be empyreumatic. That procured by the process of the Dublin College is stronger; it is also more fragrant: it has the advantage of not being liable to be contaminated by any metallic impregnation; and it is free from sulphurous acid, with a portion of which the other is sometimes impregnated. A process, which would afford it equally pure, and probably stronger, would be to decompose the solid acetate of lime by sulphuric acid, as the sulphate of lime, which would be formed, would retain the water in consequence of its strong affinity to it; or the acid may be brought to the highest state of concentration, by distilling it from dry muriate of lime.

Acetic acid, in its concentrated state, has a fragrant, and, at the same time, very sharp penetrating odour; its taste is extremely sour and pungent, and it is so acrid as to inflame the skin. It is highly volatile, evaporating at the common temperature of the atmosphere; it is also inflammable, and kindles when a burning body is approached to its vapour. It exerts the agencies of a powerful acid, and it has a peculiar action on several of the proximate principles of vegetables, whence it can be applied to pharmaceutical purposes,—dissolving them, without decomposing them, or materially altering their properties. It thus dissolves resins, gum-resins, camphor, and essential oils. It is employed medicinally, principally as a stimulating perfume in languor or faintness, or to obviate the unpleasant smell of confined or corrupted air. The combination of it with camphor is used for this purpose, as has been noticed under the chapter of medicated vinegars; the camphor being dissolved in the strong acid. Aromatic Spirit of Vinegar is a preparation of a similar kind, rather more fragrant and more pungent.

Acidum Benzoicum. Benzoic Acid. Ed.

"Take of Benzoin, twenty-four ounces; of Sub-carbonate of Soda, eight ounces; Water, sixteen pounds. Boil the benzoin, rubbed with the subcarbonate, in water for half an hour, stirring them constantly, and strain. Mix this when strained with the former liquor, and evaporate until two pounds remain. Strain again, and drop into the liquor, as long as there is any precipitation, diluted sulphuric acid. Dissolve the precipitated benzoic acid in boiling water. Strain the liquor while hot, through linen, and put it aside, that crystals may form. Dry and preserve these crystals, having previously washed them with cold water."

Acidum Benzoicum. Benzoic Acid. Lond.

"Take of Benzoin, a pound and a half; Newly Prepared Lime, four ounces; Water, a gallon and a half; Muriatic Acid, four fluidounces. Rub

the benzoin with the lime; then boil for half an hour in a gallon of water, stirring constantly with a rod, and strain the liquor when cold. Boil what remains in four pints of water, and pour off the liquor, as before. Boil down these liquors mixed together to half the quantity, then strain through paper, and drop in gradually muriatic acid, till there is no farther precipitation. Lastly, having poured off the liquor, dry the powder with a gentle heat, and put it into a proper vessel placed in sand; then sublime the benzoic acid with a gentle heat."

Acidum Benzoicum. Benzoic Acid. Dub.

"Take of Benzoin, any quantity. Melt in a retort, with a wide neck, to which adapt a receiver without luting it, and sublime. Let the sublimed matter be occasionally removed from the neck of the retort, that it may not condense in too large a quantity. This, if it is strained with oil, press wrapt in bibulous paper, to separate the oil, and again sublime."

Benzoic acid seems to exist, fully formed, in benzoin, and hence, being volatile, is easily expelled by heat. This method, still retained by the Dublin College, is the one by which it is used to be obtained. Scheele proposed as more economical, the process which has a place in the London Pharmacopœia, and of which that in the Edinburgh Pharmacopœia is the same with some slight modifications. In the one, that given by the Edinburgh College, the acid of the Benzoin combines with the soda of the carbonate of soda, forming a soluble salt; the sulphuric acid when added combines with the soda, and the benzoic acid, being sparingly soluble in cold water, is precipitated. In the other, that given by the London College, the benzoic acid combines with the lime, and forms a soluble salt; this cannot properly be decomposed by sulphuric acid, as the sulphate of lime, being sparingly soluble, would be mingled by precipitation with the benzoic acid; muriatic acid, therefore, is added, which combines with the lime; the muriate of lime remains dissolved, and the benzoic acid is thrown down.

The quantity of benzoic acid obtained by sublimation is greater than can be obtained by the other methods, the product, according to Mr. Brande's experiments, amounting to two ounces from a pound of benzoin, while by the others, it is equal only to about one ounce and six drachms. But there is a difficulty in conducting the process by sublimation, from a portion of the oily matter of the benzoin being liable to rise with the acid in vapour, and communicating to it a brown tinge. By managing the heat with due precaution, and changing the receiver towards the end of the sublimation, this may be avoided, at least so far as to obtain a pure product, nearly equal in quantity to that from the other methods; and as the sublimed acid is more white and brilliant than the precipitated acid, even when the latter is dissolved and crystallized, this method is still followed by the practical chemist, and is even more economical than the others. The London College gives the precipitated acid the same brilliant appearance by sublimation.

Benzoic acid is in slender needle-like crystals, or in soft flakes, of a white colour and silky lustre; its taste is pungent and acidulous, its odour aromatic; this odour, however, appears to arise from a minute portion of oily matter adhering to it, as, by dissolving the acid in alcohol, and precipitating it by water, it is obtained nearly inodorous. It is volatile and inflammable, is scarcely soluble in cold water, but is dissolved abundant-

ly by hot water, and is also soluble in alcohol. It has been regarded as a stimulating expectorant, but is totally destitute of medicinal efficacy, and the sole consumption of it is in the composition of the paregoric elixirs of the Pharmacopœias, in which it has long been an ingredient, and from custom is still retained.

Acidum Citricum. Citric Acid. Lond.

"Take of Lemon Juice, a pint; Prepared Chalk, an ounce, or as much as may be sufficient to saturate the juice; Diluted Sulphuric Acid, nine fluidounces. Add the chalk gradually to the lemon juice heated, and mix them; then pour off the liquor. Wash the citrate of lime which remains with water, frequently added; then dry it. To the dried powder add the diluted sulphuric acid; boil for ten minutes: express the liquor strongly through linen, and strain through paper. Evaporate the strained liquor so far, that on cooling, crystals shall form. To obtain these crystals pure dissolve them in water a second and third time; strain the solution each time; evaporate, and put it aside to crystallize."

The juice of the lemon consists principally of citric acid, from which, however, it is difficult to abstract the mucilaginous and extractive matter, so as to render it capable of being preserved. Hence the process of obtaining the acid in a pure crystallized form, originally proposed by Scheele, has been introduced into the London Pharmacopœia. The lime of the carbonate of lime added to the lemon juice, combines with the citric acid, and forms citrate of lime, which, being insoluble, is precipitated; the precipitate is washed to carry off the adhering vegetable matter, and is submitted to the action of diluted sulphuric acid: the sulphuric acid combines with the lime, and disengages the citric acid; this, dissolved by the water, is pressed out from the sulphate of lime, and by the evaporation of the solution is brought to crystallize. The crystals are at first of a brownish tinge, from the re-action, it has been supposed, of the sulphuric on the citric acid. By a second or third solution and crystallization they are obtained colourless, or white. A slight excess of sulphuric acid, Scheele found to be useful; and its operation, as Dizé has remarked, consists in decomposing a little mucilage or extractive matter, which adheres to the citric acid, and opposes its crystallization. It remains in the residual liquor without rendering the crystals impure.

With regard to the proportions, Proust makes the following remarks: To saturate four ounces of chalk, ninety-four ounces of lemon juice are required, and this affords seven ounces and a half of dry citrate of lime. Twenty ounces of diluted sulphuric acid, consisting of one part of the common sulphuric acid and three parts of water, are requisite for the saturation of four ounces of chalk, which is the quantity necessary of that acid to decompose the citrate of lime.

Citric acid may be procured from a great many other fruits. The tamarind, according to Vauquelin, has citric acid as its chief acid constituent.

Citric acid crystallizes in rhomboidal prisms; it is easily soluble in water, has a taste extremely sour, and reddens deeply the vegetable colours. In its solid state it remains unchanged, and even in solution is not very liable to spontaneous decomposition. It is used, as has already been remarked, as a refrigerant. A grateful lemonade is prepared from it, by dissolving 30 or 40 grains in a pint of water, with the addition of a little sugar, an agreeable flavour being communicated by a little dried lemon-peel having been infused in the water, or a powder formed by rubbing sugar on the

fresh lemon being dissolved in it. It is used, too, in forming the common effervescing draught, being mixed with carbonate of soda, and water added. Whether it acts with equal certainty with the recent juice, as a remedy in scurvy, remains to be ascertained.

Acidum Muriaticum. Muriatic Acid. Ed.

"Take of Muriate of Soda, previously heated to redness, Sulphuric Acid, Water, of each two pounds. Mix the acid with eight ounces of Water, and when the mixture has cooled, pour it upon the muriate of soda in a glass retort; then adapt a receiver containing the rest of the water, and distil from a sand-bath with a moderate fire. In a short time the vessels may be luted together, and the distillation continued to dryness.

"The specific gravity of the acid is to that of distilled water as 1170 to 1000."

Acidum Muriaticum. Muriatic Acid. Lond.

"Take of Dried Muriate of Soda, two pounds; of Sulphuric Acid, twenty ounces by weight; of Distilled Water, a pint and a half. Mix the acid with half a pint of the water in a glass retort, and add to these when cold the muriate of soda. Pour what remains of the water into a receiver; then a retort being adapted to it, transmit into this water the muriatic acid distilled from a sand-bath, with a heat gradually increased, until the retort become red.

"The specific gravity of muriatic acid is to the specific gravity of distilled water as 1.160 to 1.000. If into a fluidounce of it, diluted with water, a piece of marble be thrown, 220 grains ought to be dissolved."

Acidum Muriaticum. Muriatic Acid. Dub.

"Take of Dried Muriate of Soda, Sulphuric Acid, Water, of each six pounds. Add the acid diluted with the water, after it has become cold, to the muriate put into a glass retort; then distil to dryness."

"The specific gravity of this acid is to that of distilled water as 1170 to 1000."

In these processes the sulphuric acid combines with the soda of the muriate of soda, and with the assistance of the heat applied, disengages the muriatic acid gas, which is condensed partly by the water volatilized with it, and partly by the water in the receivers.

The principal difference in the process in the different Pharmacopœias, is with regard to the proportions of the ingredients. It would require comparative experiments to determine which is the best proportion; in the formula of a former edition of the Edinburgh Pharmacopœia, the proportion of acid was too small, chemists having been formerly led into error in cases similar to this, by supposing, that in decomposing a compound salt by an acid, there is no advantage in adding more of the decomposing acid than is necessary to neutralize the quantity of base which the portion of salt operated on contains. The quantity, however, was not even sufficient for this; and I have accordingly observed, in performing the process according to that formula, that a portion of undecomposed muriate of soda always exists in the residual mass. The precise quantity that is required for the neutralization of the soda is 20 of sulphuric acid to 24 of the muriate of soda; this proportion is ordered in the late edition of the London Pharmacopœia; that in the Dublin Pharmacopœia is more than the due proportion, and in the last edition of the Edinburgh Pharmacopœia, there are four ounces more than the precise quantity required for the neutralization of the soda. It is sufficiently established, however, that in cases of

this kind, the product is increased by employing more of the decomposing agent than is strictly necessary to neutralize the ingredient with which it combines; and that if this excess be not employed, a portion of the compound operated on remains undecomposed. It is probable, therefore, that this last proportion is not much different from that which it will be economical to use.

With regard to the other parts of the process, the direction, that the sulphuric acid be diluted only with a portion of the water, and that the remaining water be put into the receiver, is proper, both as abridging the distillation, and assisting the condensation of the acid gas. An apparatus, on the construction of Woolfe's, is sometimes employed, but is unnecessary, as a range of two or three receivers, without tubes immersed in the liquid in each, is sufficient. The advantage of diluting the acid with a portion of the water, is, that the rapid effervescence and disengagement of gas produced by the action of the concentrated acid on the muriate of soda is prevented, and the process is rendered more manageable: it is much more convenient, however, to pour the acid on the salt in the retort, than to follow the reverse mode directed by the London College. The salt which remains in the retort is extracted by pouring water on it when cold, its solution being favoured by the excess of acid. In the large way the distillation is sometimes performed from an iron pot, connected by an earthern head and tube with a range of receivers, the fire being directly applied, and then the concentrated sulphuric acid is poured directly on the muriate of soda, undiluted, to lessen the action on the iron. But the acid prepared in this way, even when the precaution is followed, of coating the inner surface of the pot, is always contaminated with this metal. The yellow colour which it usually has, is not always, however, owing to the presence of iron, but is derived sometimes from a little extractive matter adhering to the sea salt, and it is to consume this that the salt is ordered, in the Edinburgh Pharmacopœia, to be exposed to a red heat,—an operation which would otherwise be superfluous. The yellow colour may be removed by distilling the acid a second time from a little muriate of soda. To the test of the strength of the acid from its specific gravity, the London College have added, that a fluidounce of it, diluted with water, dissolves 220 grains of marble. Philips, however, in his Experimental Examination, states that only 204 grains are decomposed. He farther adds, that the specific gravity of the acid, instead of being 1.160, is only 1.142, which in some measure explains the reason why there is only 204 grains of carbonate of lime decomposed by a fluidounce of the acid. When the acid is of the specific gravity of 1.170, which is that assigned by the other colleges, it dissolves about 240 grains.

Muriatic acid exists when uncombined in the elastic form, and is incapable of condensation by any cold or pressure hitherto applied to it. But it is rapidly and largely absorbed by water; the water, at a common temperature, and under a mean pressure, condensing 360 times its volume. When of the specific gravity of 1.170, it contains about 22 of acid, and 78 of water; it emits pungent vapours of muriatic acid gas on exposure to the air, reddens deeply the vegetable colours, tastes extremely sour, erodes immediately vegetable and animal substances, and exerts considerable chemical agencies. The acid, however, not yielding oxygen readily, can oxidate inflammable and metallic substances, only by enabling them, by a resulting affinity, to attract oxygen from the water with which it is combined.

Muriatic acid has not been analysed, those substances which decom-

pose other acids by abstracting oxygen having no effect in producing its decomposition. Its elements, therefore, must be retained in union by a powerful affinity.

Some important facts have been established, however, with regard to its constitution, and particularly to its chemical relation to water. Muriatic acid gas has been supposed to be the real acid, or at least to contain only a minute proportion of water. Gay Lussac and Thenard shewed, that it contains water in intimate combination equal to one-fourth of its weight. Thus, when the acid gas is transmitted over oxide of lead, it is condensed in combination with the oxide, and a portion of water equal to this quantity is liberated. Or if oxymuriatic gas, the substance formed by the combination of muriatic acid and oxygen, be mingled with hydrogen gas, and exposed to light to favour their mutual action, muriatic acid gas is formed, the oxygen of the oxymuriatic acid combining with the hydrogen, and forming water, which remains in combination with the acid in the gaseous form. This water has the most important influence on the chemical relations of the acid, and, in particular, by its affinity to it, favours its transition to its insulated state, and is even essential to its existence in that state. No compound, of the real acid with any base, such as dry muriate of potash or of soda, can be decomposed by a dry acid, even when the most powerful heat is applied ; but if a little water is introduced, the decomposition takes place with facility, and muriatic acid gas is rapidly disengaged. For the same reason, oxymuriatic acid gas is incapable of decomposition if water be excluded ; charcoal, for example, aided by the most intense heat, has no effect upon it. But if water be admitted, even the weak action of solar light is sufficient to expel its oxygen, the muriatic acid receiving that portion of water necessary to its existence in its insulated form. Hence, too, in all cases of the action of muriatic acid on inflammable or metallic bases, the base receives oxygen from the water present, hydrogen is disengaged, and the oxide formed combines with the real acid. While in the action of oxymuriatic acid on the same bases, its oxygen combines with the base, and the oxidated product, in like manner, combines with the real acid, forming the same compound.

In these results, muriatic acid displays relations similar to the other powerful acids. They all exert to water a powerful affinity, contain a portion of it in intimate combination, and cannot be obtained free from this combined water in an insulated state. The only peculiarities with regard to muriatic acid, are its not being capable of being decomposed by those processes which affect the decomposition of the other acids, and its combining with oxygen with facility ; peculiarities probably arising from the same cause, the powerful affinity of its base to oxygen.

These fasts have been explained, however, on a different hypothesis, suggested by Gay Lussac and Thenard, and supported by Sir H. Davy, that oxymuriatic gas, instead of being a compound of muriatic acid and oxygen, is a simple substance, and that muriatic acid is a compound of it with hydrogen. According to this doctrine, the production of muriatic acid gas, in the mutual action of oxymuriatic gas and hydrogen, is a simple combination. The substances formed by the action of oxymuriatic gas, or chlorine as it has been named, on inflammable or metallic bases, are compounds of the base and the oxymuriatic principle. The production of the same compounds, by the action of muriatic acid on these bases, is conceived to arise from the decomposition of the acid, its hydrogen being disengaged, and its other element combining with the base. The water deposited when muriatic

acid gas acts on metallic oxides is supposed to be formed by the decomposition of the acid, its hydrogen combining with the oxygen of the oxide, and the products, however analogous to metallic salts, are not saline substances, but are supposed to be compounds of the metals with chlorine. The production of oxymuriatic acid, by the usual process, is ascribed to the oxygen imparted to the muriatic acid decomposing it, by combining with its hydrogen, forming water, and liberating the chlorine ; and the disengagement of oxygen from oxymuriatic acid is supposed to arise from the decomposition of water, the hydrogen of which unites with the chlorine, and forms muriatic acid. It would be foreign to the objects of this work to enter on any examination of these opinions. The common doctrine is deduced by the strictest reasoning from the facts, is least complicated, and most conformable to analogy in all its explanations ; the opposite opinion rests on no conclusive evidence, and seems in a great measure to have been supported on mistaken views of what constitutes chemical induction.

Muriatic acid is applied to few medicinal purposes. It has been given as a refrigerant and antiseptic in scarlatina, and fevers of the typhoid type, in a dose of 10 or 15 drops occasionally : in the same disease it is used largely diluted as a gargle. As a refrigerant, it is sometimes prescribed to relieve ardor urinæ in gonorrhœa. It has also been employed, as has been already stated, as a lithontriptic ; and in some cases of calculus considerable advantage has been derived from it, both in relieving the pain. and diminishing the sediment deposited from the urine, probably in consequence of its solvent power being exerted on the phosphate of ammonia and magnesia, or the phosphate of lime, which are frequently ingredients of urinary calculi. By some also it has been recommended as an antidote in general syphilitic affections ; the remarks of Mr. Pearson, however, subvert this opinion, still allowing that it exerts, in many cases, a very beneficial and salutary action on the stomach and general health. It has been taken in a dose of from 20 to 30 drops. From its chemical agency, it is employed in various Pharmaceutic processes. In the state of gas, it has been used to neutralize contagious effluvia, but it is inferior in efficacy to nitric or oxymuriatic acid.

Acidum Muriaticum Dilutum. Diluted Muriatic Acid. Dub.

" Take of Muriatic Acid, Distilled Water, each one pound. Mix them." The specific gravity of this acid is to that of distilled water as 1080 to 1000.

Aqua Alkalina Oxymuriatica et Aqua Oxymuriatica. Alkaline Oxymuriatic Water, and Oxymuriatic Water. Dub.

" Take of Muriate of Soda dried, two pounds ; Manganese in powder, one pound ; Water, Sulphuric Acid, each two pounds. Put the muriate of soda and the manganese mixed together into a matrass, and add the water ; then by a convenient apparatus add the sulphuric acid gradually, and at intervals ; transmit the gas which is disengaged through a solution of four ounces of carbonate of potash, in twenty-nine ounces of water. Toward the end of the operation, apply a moderate heat to the matrass.

" The specific gravity of this liquid is to that of distilled water as 1087 to 1000.

" The Oxymuriatic Water is prepared by transmitting the superfluous gas of the above process, by a proper apparatus, through a pint of distilled water.

"The specific gravity of this liquor is to that of distilled water as 1003 to 1000."

When muriate of soda, black oxide of maganese, and sulphuric acid, are mingled together, the sulphuric acid combining with the soda disengages the muriatic acid; which, by the action of the oxygen of the oxide of manganese, is converted into oxymuriatic acid, and assumes the elastic form; this change, according to the common doctrine, explained under the preceding process, consisting in the combination of the oxygen and the muriatic acid, while, according to the opposite hypothesis, it is owing to the decomposition of the muriatic acid, the hydrogen supposed to be one of its elements combining with the oxygen and forming water, while the chlorine, the other element, is liberated. The process is attended with some difficulty. If the sulphuric acid is concentrated, its action is too rapid, and gives rise to a disengagement of gas not easily regulated; and if any part of the elastic product is forced from the apparatus, it is injurious to the operator, from its highly suffocating odour. It is proper, therefore, to use the acid a little diluted, and after the commencement of the operation, to favour its progress by the application of a moderate heat. The proportions of the ingredients recommended by Vauquelin, are four parts of muriate of soda, one of oxide of manganese, three of sulphuric acid, and two of water. When the combination, either with water, or with an alkaline solution, is to be effected, it is proper to use the bottles of Woolfe, so as to transmit the gas through the liquid, the first bottle being left empty to collect a little common muriatic acid that distils over, holding oxide of manganese dissolved.

Oxymuriatic acid exists in the gaseous form, and is distinguished from other elastic fluids by its colour, which is yellowish-green. It has an intolerable suffocating odour. Water, at a moderate temperature, absorbs twice its volume of it, forming a liquid of a yellowish colour, having the same odour, and a harsh styptic taste. The acid, both in its gaseous and liquid form, is distinguished by its power of destroying the vegetable colours.

Oxymuriatic gas has been employed to neutralize the agency of contagion, and change the noxious constitution of foul or corrupted air. Dr. Willan has employed it in Cynanche Maligna with some success, and Mr. Braithwaite recommends it strongly in Scarlatina. Half a drachm to two drachms, diluted in eight ounces of water, are given in the course of twenty-four hours. The application of it for neutralizing contagion will be noticed under its history, along with the other gases, in the appendix to this work. In its pure state the oxymuriatic acid is not applied to any other medicinal use, and there is therefore scarcely any necessity for the solution of it in water, which has received a place in the Dublin Pharmacopœia.

The salt obtained by transmitting the oxymuriatic acid gas through a solution of potash, and named the Oxymuriate of Potash, it has already been remarked, has been received into the Materia Medica, and has been employed as an antisyphilitic remedy. This salt is not strictly an oxymuriate, but the compound of an acid containing still more oxygen than the oxymuriatic acid, what has been named the Hyper-oxymuriatic acid. When the oxymuriatic gas is introduced into the alkaline solution sufficiently concentrated, it undergoes a singular decomposition; one portion of it returns to the state of muriatic acid, and combines with part of the

alkaline base; the other portion, receiving the oxygen which this had parted with, passes to the state of an acid, having a still larger proportion of oxygen in its composition than the oxymuriatic acid has, and this combines with another portion of the alkali. The former salt, the muriate of potash, remains dissolved; the other, being more sparingly soluble, is deposited in crystalline plates. These form the salt named Oxymuriate, but more properly Hyper-oxymuriate of Potash, (Hyper-oxymurias Potassæ.)

These combinations are much influenced by the concentration of the alkaline solution. If it is much diluted, the oxymuriatic acid is absorbed by it, and remains united with the water and the alkali without decomposition; as is evident from the liquor retaining the property of destroying the vegetable colours,—a property belonging to the oxymuriatic acid, but not to the hyper-oxymuriate of potash. It is only when the action of the alkali on the acid is favoured by concentration, that the decomposition takes place, and Berthollet has supposed, even, that it is much determined by the operation of crystallization itself. The alkaline solution, therefore, into which the oxymuriatic acid gas is transmitted, ought to be of such a strength that the hyper oxymuriate will be formed in it, and crystallize spontaneously. The solution ordered by the Dublin College appears to be too weak, and the liquor obtained by their process probably contains much of the oxymuriatic acid undecomposed. A solution of the proper strength is obtained by dissolving sixteen ounces of subcarbonate of potash in four pounds of water; and as the disengagement of the carbonic acid, by the action of the oxymuriatic acid, is troublesome, it is better to remove it by previous agitation of the solution with eight ounces of lime. From this solution, when the transmission of the oxymuriatic gas is continued for a sufficient time, the hyper-oxymuriate crystallizes spontaneously, and the quantity of crystallized salt ought not to be increased by any evaporation of the liquor, as a portion of muriate of potash might crystallize along with it. The crystals are therefore removed, washed with a little cold water, and dried. And when the salt is medicinally used, it ought always to be under this crystallized form. The solution ordered in the Dublin Pharmacopœia must be an uncertain preparation.

Hyper-oxymuriate of potash crystallizes in thin quadrangular tables, white, with considerable lustre. Its taste is cool and penetrating. It dissolves in 17 parts of cold water, and in 5 of boiling water; is fused by heat; and by a higher heat is decomposed, giving out very pure oxygen gas. From the facility with which it parts with oxygen, it acts with much force on inflammable bodies, producing, by mere trituration with them, or percussion, violent deflagrations or detonations.

Its medicinal applications have been already pointed out. When nitric acid was introduced as a remedy in syphilis, the theory which suggested its use, that it operates by communicating oxygen to the system, led to the employment of hyper-oxymuriate of potash, as a more powerful oxygenating remedy. It was given in a dose of ten grains thrice a-day; and from the cases then brought forward, appeared to be superior even to nitric acid in suspending the symptoms of syphilis. It was not however ultimately established in practice; and as no great advantage appears to be derived from it as an auxiliary to mercury, it is now seldom prescribed.

Acidum Nitrosum. Nitrous Acid. Ed.

"Take of Nitrate of Potash bruised, two pounds: Sulphuric Acid, sixteen ounces. The nitrate of potash being put into a glass retort, pour

upon it the sulphuric acid, and distil from a sand-bath with a fire gradually raised, until the iron pot is at an obscure red heat.

"The specific gravity of this acid is to that of distilled water as 1520 to 1000."

Acidum Nitrosum. Nitrous Acid. Dub.

"Take of Nitrate of Potash, six pounds; Sulphuric Acid, four pounds. Mix and distil to dryness. The specific gravity of this acid is to that of distilled water as 1500 to 1000."

In this process the sulphuric acid combines with the potash, and disengages the nitric acid. The latter acid, however, suffers a partial decomposition during the distillation, principally from the effect of the heat, and partly probably from the relation of the acid to water. Nitric acid retains a considerable quantity of water in intimate combination, and it cannot be obtained without this water in an insulated state. As it exists in nitre, it is partly deprived of this, and the sulphuric acid employed to disengage it does not appear to be capable of affording that portion of water necessary to preserve the constitution of the nitric acid. When heat is applied, therefore, so as to disengage the latter acid, it is at the same time partially decomposed; it loses a part of its oxygen, and a quantity of nitric oxide gas is formed; this is absorbed by the portion of nitric acid not decomposed, and forms the nitrous acid, which is of a yellow or red colour, more or less so, according as it is more largely impregnated with nitric oxide, and according, therefore, to the degree of heat employed in the distillation. This decomposition takes place principally towards the end of the distillation, when the heat is high, and the water of the materials has been in a great measure volatilized, and the acid, therefore, is of a deeper colour, and more fuming, as the distillation has been continued longer. The proportion of sulphuric acid requisite to neutralize the potash of the nitrate of potash, is about half the weight of the salt; but a larger quantity is ordered in both the Pharmacopœias, and is found useful in practice, partly as rendering the decomposition more complete, and partly probably by preserving the constitution of the nitric acid by affording water. The residuum is therefore sulphate of potash, with an excess of acid. It sometimes contains minute quantities of sulphuric acid and muriatic acid; the first is detected by adding muriate of barytes to the acid diluted with five parts of distilled water, sulphate of barytes being formed; the other is detected by nitrate of silver, muriate of silver being precipitated. When not intentionally added, however, these acids are never present in sufficient quantity to render it unfit for medicinal or pharmaceutical use.

Nitrous acid is extensively employed as a pharmaceutic agent; from the facility with which it parts with oxygen, it is one of the most important, particularly in oxidating and dissolving the metals. Its powers as a tonic and antisyphilitic remedy have been already considered; though, when it is internally administered, it is necessarily given in the state of nitric acid, being brought to this state by dilution with water. Mr. Carmichael states, that when dropsy supervenes after repeated courses of mercury, the exhibition of the nitrous acid, combined with digitalis, and given in as large doses as the stomach will bear, is attended with great benefit. In the state of vapour, it has been employed under the form of fumigation to destroy contagion; the due proportion of nitre and sulphuric acid being mingled together in small earthen cups, which are put in warm sand, and placed in

the apartment designed to be fumigated, and, though inferior to oxymuriatic acid in power, it has the advantage that it can be applied without requiring the removal of the sick.

Acidum Nitricum. Nitric Acid. Ed.

"Take of Nitrous Acid, any quantity. Put it into a glass retort, and a cold receiver being adapted, apply a very gentle heat until the reddest part shall have passed over, and the acid which remains in the retort almost colourless shall have become nitric acid."

Acidum Nitricum. Nitric Acid. Lond.

"Take of Nitrate of Potash dried, Sulphuric Acid, each by weight two pounds. Mix them in a glass retort; then distil the nitric acid with the heat of a sand-bath, until red vapours are produced. Lastly, having poured the distilled acid on an ounce of dried nitrate of potash, distil it again in a similar manner.

"The specific gravity of nitric acid is to that of distilled water as 1500 to 1000. If a piece of marble be put into a fluidounce of it diluted with water, one ounce ought to be dissolved."

The process given in the Edinburgh Pharmacopœia is that which has been usually followed by chemists to convert nitrous into nitric acid. Nitrous acid is nitric acid holding dissolved a portion of nitric oxide gas; when heat is applied, the nitric oxide being more disposed than the acid to assume the elastic form, the affinity by which it is retained in combination with it is weakened, and it is disengaged: this affinity, however, so far continues to operate, that the gas carries a portion of the acid along with it, and it rises therefore in the state of very deep coloured nitrous acid vapour. The process is thus so far attended with loss, but this may be obviated by condensing the nitrous acid vapour, by a portion of water put in the receiver, by which a diluted acid will be obtained. The heat ought to be applied by a water-bath, this being sufficiently high to expel the nitric oxide gas, and being not so high as to produce decomposition of the acid.

It is difficult, however, by this method, to obtain perfect nitric acid; that is, the acid altogether colourless; the last portion of nitric oxide, communicating a pale straw colour, is retained by such an affinity, and the volatility of the acid in this state approaches so nearly to that of nitric acid, that the whole distils over. A more perfect process to obtain colourless nitric acid, is to distil the nitrous acid from a little black oxide of manganese, which yields oxygen to the nitric oxide.

The process of the London Pharmacopœia is of a different kind. From the large quantity of sulphuric acid employed to decompose the nitre, the acid is obtained by the first distillation more nearly in the state of nitric. The operation of this excess of sulphuric acid, in preventing the partial decomposition which would form nitrous acid, probably depends on two circumstances: one, that from the quantity adding to the force of the affinity it exerts to the potash of the nitre, less heat is required to effect the decomposition, and the greater part of the nitric acid is brought over before it is necessary, in continuing the distillation, to raise the temperature so high as to evolve nitric oxide; the other, that the water of this excess of acid is volatilized in the progress of the distillation, and contributes to preserve the constitution of the nitric acid in the manner which has been explained under the preceding process. The influence of the latter circumstance is very well shewn by the fact, that the product, instead of be-

ing superior in specific gravity to nitrous acid, as concentrated nitric acid is, is inferior, being, as stated in a report made to the College on the products of this process from different proportions of the materials, 1.50, while the nitrous acid obtained from 6 of nitre and 3 of sulphuric acid, is stated as having been obtained at 1.53. The weight too of the former, from a given quantity of nitre, amounted to four, that of the latter only to three. The relative value of the two is expressed by the quantity of marble they dissolve, that of the nitrous being stated at twenty-one, that of the nitric twenty nine. This expresses probably, (for they are not stated in a very distinct manner), not the relative strengths of equal weights of the two, but the relative strength of the entire products from a given weight of nitre; for were the former the meaning, an acid of low specific gravity would be represented as stronger than one of higher specific gravity. It will thus follow, that though a larger quantity of acid is obtained from the materials, by the mode of conducting the process in the London Pharmacopœia, the acid itself is not in its concentrated state. The drying of the nitre as ordered by the London College is altogether superfluous, and so far as it has any effect, counteracts the object of the process, by favouring the decomposition of the nitric acid. The second distillation is likewise unnecessary. The process is so imperfect in affording an acid which is properly nitric, that it ought to be discarded, though it may be economical in affording an acid of inferior strength.

Nitric acid is applied to the same purposes as nitrous acid. Medicinally they must be the same, as the nitrous, by the dilution necessary for its administration, is converted into the nitric. And in their chemical agencies, and therefore in their pharmaceutical applications, they are precisely alike.

Acidum Nitrosum Dilutum. Diluted Nitrous Acid. Ed.

"Take of Nitrous Acid, Water, equal weights. Mix them, avoiding the noxious vapours."—The same proportions are ordered by the Dublin College.

Acidum Nitricum Dilutum. Diluted Nitric Acid. Lond.

"Take of Nitric Acid, a fluidounce; of distilled Water, nine fluidounces. Mix them."

Acidum Nitrosum Dilutum. Diluted Nitrous Acid. Dub.

"Take of Nitrous Acid, and Distilled Water, of each one pound.

"The specific gravity of this mixture, is to that of distilled water as 1280 to 1000."

In combining nitrous acid with water, the greater part of the nitric oxide gas, if it is highly charged with it, is disengaged with effervescence; if less is present, it is retained and converted into nitric acid by the oxygen held loosely dissolved by the water. This, therefore, is diluted nitric acid. It is employed in a number of the chemical processes of the pharmacopœia, and is convenient, in particular, for the solution of metals, being of that strength at which its action upon them is not too rapid. The diluted nitric acid of the London Pharmacopœia is too weak for this; it can only be intended for internal administration; and as for this purpose it will require still farther dilution, the proportion might be left to be regulated by extemporaneous prescription. The deviation from the proportions in the other Pharmacopœias is therefore without any adequate reason or advantage, and may sometimes lead to dangerous consequences in medicinal prescriptions.

Acidum Sulphuricum Dilutum. Diluted Sulphuric Acid. Ed.

"Take of Sulphuric Acid, one part; Water, seven parts. Mix them."

Acidum Sulphuricum Dilutum. Diluted Sulphuric Acid. Dub.

"Take of Sulphuric Acid, two ounces by weight; Distilled Water, fourteen ounces by weight. Having mixed them gradually, put aside that they may cool; then pour off the clear liquor. The specific gravity of this acid is to that of distilled water as 1090 to 1000."

Acidum Sulphuricum Dilutum. Diluted Sulphuric Acid. Lond.

"Take of Sulphuric Acid, a fluidounce and a half; of Distilled Water, fourteen fluidounces and a half; add the Acid gradually to the Water; then mix them."

The intention of this formula is to afford an acid sufficiently dilute to admit of its dose being easily regulated. The London College have, without any necessity, altered the proportions both from those of the other Pharmacopœias, and from those which had formerly been ordered in their own Pharmacopœia: they order a fluidounce and a half of sulphuric acid to be mixed with fourteen fluidounces and a half of distilled water, giving the proportion by weight of one part of acid, to nearly five and a half of water. The reason given for this change is, "that the mixture will be more conveniently made, and its dose more easily apportioned, that that of the former Pharmacopœia." The absurdity of this is obvious. A mixture of sulphuric acid with water is made just as easily in one proportion as in another, and the dose of the diluted acid, whatever may be its strength, is apportioned with equal facility. Nor is it of any importance to have any relation between the dose of the diluted acid and any particular quantity of the concentrated acid, as the acid in the latter state has never been prescribed internally. It is to be regretted, that the strength of a preparation, which has for a considerable period been employed in medical practice, has been thus unnecessarily changed, and changed to such an extent.

The preparation of Sulphuric Acid being carried on on a large scale, for the purposes of commerce, no process is given for it in any of the Pharmacopœias, nor could it be executed in the shops. It is formed by burning sulphur mixed with from one-eighth to one-tenth of nitrate of potash, in large leaden chambers. By the oxygen afforded by the nitre, the sulphur is enabled to burn slowly, though the chamber be closed so as to admit of a circulation of air, and the acid formed is principally the sulphuric, while, from the combustion of sulphur in atmospheric air alone, sulphurous acid chiefly is produced. The cause of this appears principally to be, that from the decomposition of the nitric acid of the nitre, nitric oxide gas is evolved; this combines with the oxygen of the atmospheric air in the chamber, and forms nitrous acid vapour, which, in its turn, yields oxygen to the sulphurous acid formed by the combustion of the sulphur. The diffusion of watery vapour too through the chamber probably facilitates the formation of sulphuric acid. The acid vapours are absorbed by water placed in the bottom. This liquor, when sufficiently acidulated, is concentrated by evaporation, and afterwards by boiling it in glass retorts, and an acid is obtained, thick and oily in its appearance, colourless and transparent, having a specific gravity of 1850. Formerly this acid was procured from the decomposition of sulphate of iron, the green vitriol of commerce, by heat; and hence the orgin of the name, Vitriolic Acid, by which it has been known.

Sulphuric acid prepared in this manner is not perfectly pure. It contains a quantity of sulphate of potash, (the acid combining with a portion of the potash of the nitre,) and sometimes a small portion of sulphate of lead, derived from the action of the acid on the lead of the chamber. From these it is in a great measure purified by dilution with water, the diluted acid being incapable of holding them dissolved: hence one advantage of the dilution. The dose of the diluted is also more manageable than that of the concentrated acid. As an astringent it is taken to the extent of from fifteen to thirty drops, in a cupful of water.

CARBONAS POTASSÆ. Carbonate of Potash. Ed.

"Take of pure Subcarbonate of Potash two parts, Water, three parts. Dissolve the salt in the water, and expose it in a proper apparatus to a stream of carbonic acid gas. Strain the solution when it no longer absorbs the acid, and then evaporate by a heat of not greater than 180°, so as to obtain crystals. Carbonic Acid is easily obtained from equal weights of carbonate of lime, and sulphuric acid freely diluted with water."

POTASSÆ CARBONAS. Carbonate of Potash. Lond.

"Take of Subcarbonate of Potash, prepared from Tartar, a pound; Subcarbonate of Ammonia, three ounces; Distilled Water, a pint. Add to the potash dissolved in the Water, the subcarbonate of ammonia; then, by a sand-bath, apply a heat of 180 degrees for three hours, or until the ammonia is expelled; lastly, put the liquors aside that crystals may form. Let the residual liquor be reduced by evaporation, in a similar manner, so that when set aside it may again afford crystals."

The intention of this process is to obtain potash saturated with carbonic acid, the carbonic acid required for this being abstracted from the ammonia, and the ammonia being expelled by the heat. The same object is obtained with equal facility by transmitting a current of carbonic acid gas through a solution of one part, or two parts, according to the Edinburgh Pharmacopœia, of sub-carbonate of potash, in three parts of water; and the salt obtained from this solution by spontaneous crystallization is probably more pure, as in the former method a little of the ammonia may remain. The carbonate crystallizes in quadrangular prisms which are not deliquescent: they are soluble in four quarts of cold water. The taste of this salt is mild, but somewhat alkaline, and it changes the vegetable colours to a green: it is therefore a subcarbonate. It contains twice the quantity of carbonic acid of the common subcarbonate, and has hence been distinguished by the name of bi-carbonate, and more lately by the name of carbonate. According to Pelletier, it consists of 40 of potash, 43 of carbonic acid, and 17 of water. Dr. Wollaston rates the proportions higher, 47.1 potash, 43.9 acid, and 9 water. It has been introduced as an antacid, in preference to the other, as being milder; and, from the larger quantity of carbonic acid which it yields, it answers better for preparing the effervescing draught.

SUBCARBONAS POTASSÆ. Subcarbonate of Potash. Ed.

"Let impure Subcarbonate of Potash be put in a crucible and exposed to a red heat, then triturate it well with an equal weight of water. The liquor, after the impurities have subsided, being poured into a clean iron pot, is to be boiled to dryness, stirring the salt constantly towards the end of the boiling, that it may not adhere to the vessel.

POTASSÆ SUBCARBONAS. Subcarbonate of Potash. Lond.

"Take of impure Potash in powder, three pounds; of boiling Water, three pints and a half. Dissolve the potash in the water, and strain; then pour it into a clean iron vessel, and dissipate the water by a gentle heat, so that the liquor may become thick; afterwards having withdrawn the fire, stir it constantly with an iron spatula until the salt pass into small grains.

"A purer subcarbonate of potash may be prepared in the same manner from tartar, which has been first burnt, until it be of a gray colour."

Subcarbonas Kali. Subcarbonate of Kali. Dub.

"Take of Potashes in coarse powder, Cold Water, of each six pounds. Mix by rubbing them together, and macerate for a week in an open vessel. stirring occasionally: then strain the ley, and evaporate to dryness, in a very clean iron vessel, stirring the saline mass constantly towards the end of the evaporation, with an iron spatula. When reduced in this manner to a coarse powder, let it be kept in close vessels.

"Before dissolving the Potashes in water, if they are very impure, let them be calcined in a crucible until they become white."

The Potash and Pearl-ash of commerce are obtained by the incineration of the wood of land vegetables: the ashes being lixiviated with water, so as to dissolve the saline matter, and this being evaporated to dryness. The dry mass consists principally of subcarbonate of potash, with smaller quantities of sulphate and muriate of potash, siliceous earth, and metallic matter, principally oxide of manganese and iron. These are in a great measure abstracted by the above process, the subcarbonate of potash, from its greater solubility, being dissolved, while the others, especially the earthy and metallic matter, from the small quantity of water employed, remain undissolved.

This saline matter is in the state of subcarbonate. It is deliquescent, acrid, changes the vegetable colours to a green, and has the general alkaline properties. It consists, according to Kirwan, of about 60 of potash, 30 of carbonic acid, and 6 of water, with a few grains in 100 of sulphate of potash, siliceous and argillaceous earth. It is seldom applied to any medicinal use, but is employed principally as an agent in Pharmacy.

Liquor Potassæ Subcarbonatis. Liquor of Subcarbonate of Potash. Lond.

"Take of Subcarbonate of Potash, a pound; of Distilled Water, twelve fluidounces. Dissolve the subcarbonate of potash in the water, and strain through paper."

Aqua Subcarbonatis Kali. Water of Subcarbonate of Kali. Dub.

"Take of Subcarbonate of Kali, any quantity. Put it into an open glass funnel, the throat of which is obstructed with linen. Put this aside in a cellar, that the salt may liquefy in the humid atmosphere. Receive the liquor in a vessel beneath."

The first of these liquors is a solution of subcarbonate of potash in water; the latter approaches nearer to the state of carbonate, as carbonic acid is absorbed from the air. Both are adapted principally to pharmaceutical use.

Subcarbonas Potassæ Purissimus. Pure Subcarbonate of Potash. Ed.

"Take of impure Supertartrate of Potash, any quantity. Having wrapped it up in moist bibulous paper, or put it into a crucible, burn it into a

black mass, by placing it among live coals. Having reduced it to powder, subject it to a moderate heat, in an open crucible, until it become white, or at least of an ash-grey colour, care being taken that it do not melt. Then dissolve it in warm water; strain the liquor through linen, and evaporate it in a clean iron vessel. stirring the matter constantly, towards the end of the evaporation, with an iron spoon, that it may not adhere to the bottom of the vessel. A very white salt will remain, which is to be left a little longer on the fire until the bottom of the vessel is nearly at a red heat. When cold, it is to be kept in glass vessels well stopt."

Kali e Tartaro. Kali from Tartar. Dub.

"Take of Crystals of Tartar any quantity. Expose it to a red heat in a silver crucible lightly covered until it cease to emit vapours. Reduce the residual matter into coarse powder, and calcine it in the same crucible without a cover for two hours, stirring it constantly. Then boil it with twice its weight of water for a quarter of an hour, and, after sufficient subsidence, pour off the pure liquor. Let this be done thrice. Strain the mixed liquors, and evaporate in a silver vessel; bring the residual salt, as it becomes dry, into grains by frequent agitation; then expose it to a low red heat; remove it from the vessel before it is entirely cold, and and keep it in phials well stopt."

By exposing supertartrate of potash to heat, the tartaric acid is decomposed. Part of its carbon and oxygen unite and form carbonic acid, which is attracted by the potash; and, by continuing the heat, the remaining carbonaceous matter is burnt out. The supertartrate of potash of commerce usually contains a little tartrate of lime, which by the heat is converted into carbonate of lime; but by dissolving the saline matter in water, this, and any other earthy substances, are separated, and, by evaporation, a salt is obtained, which, like the former, is a subcarbonate of potash, but more pure. It appears also to contain rather a larger proportion of carbonic acid. The process, however, being more expensive than the preceding one, the product of it is not often to be found in the shops.

Aqua Potassæ. Water of Potash. Ed.

"Take of newly prepared Lime, eight ounces; Subcarbonate of Potash, six ounces; Boiling Water, twenty-eight ounces. Pour over the lime in an iron or earthen vessel, twenty ounces of the water. The ebullition being finished, immediately add the salt, dissolved in eight ounces of water; and the whole being well mixed, close the vessel until they become cold. Let the cold materials, previously well agitated, be poured into a glass funnel, the tube of which is obstructed with clean linen. Cover the upper orifice of the funnel, while the neck of it is inserted in another glass vessel, that the water of potash may gradually drop through the linen into the lower vessel. When it first ceases to drop, pour into the funnel a few ounces of water, but cautiously, so that it may swim above the matter. The water of potash will again begin to drop. In this manner the affusion of water is to be repeated, until three pounds have filtered, which will be in the space of two or three days. The upper parts of the liquor are finally to be mixed with the lower by agitation, and it is to be kept in a vessel well stopt."

Liquor Potassæ. Liquor of Potash. Lond.

"Take of Subcarbonate of Potash, a pound; newly prepared Lime, half a pound; of Boiling Distilled Water, a gallon. Dissolve the potash in two pints of the water. Add to the lime what remains of the water.

Mix the liquors together while hot, then put them into a covered vessel, and after they are cold, strain through cotton cloth.

"If any diluted acid dropt in excite effervescence, it is necessary to add more lime, and again strain."

"A pint of this liquor ought to weigh sixteen ounces."

Aqua Kali Caustici. Water of Caustic Kali. Dub.

"Take of recently calcined Lime, eight ounces; Subcarbonate of Kali, six ounces. Sprinkle on the lime in an earthen vessel, two pints of boiling water, and when slaked mix the salt with it, and close the vessel. Put the mixture as soon as it has cooled into a glass funnel, the throat of which is stopped with linen. The funnel being covered, let the ley drop into a vessel beneath, pouring water on, until three pounds have dropt through. Agitate the liquor and preserve it in a vessel of green glass, well stopt. The ley, if properly prepared, will be free from colour and smell, and will scarcely effervesce when mixed with acids. If there is any sensible effervescence, add to it a little recently calcined lime reduced to a very fine powder; digest for twenty-four hours in a close vessel, agitating occasionally. Lastly, strain the ley in the manner above directed.

"The specific gravity of this liquor is to that of distilled water as 1100 to 1000."

In this process the lime abstracts the carbonic acid from the potash: it is difficult, however, to abstract it entirely, and hence the necessity for the peculiar arrangement employed, in which a large quantity of lime is used, and in which it is made to act in the most favourable manner by putting the mixture into a funnel, the tube of which is nearly obstructed, so that the alkaline solution must filtrate slowly through the mass of lime. The affinity of the lime to the carbonic acid is thus aided, and the greater part of the acid is abstracted from the potash. Still, however, from the effect of quantity on the force with which affinity is exerted, a small quantity is retained in combination with the potash, which cannot be abstracted by this process. But if the lime has been in a sufficiently active state, and the directions duly observed, so that the filtration has been performed slowly, it is very inconsiderable, as is apparent from scarcely any sensible effervescence being excited by the addition of an acid, and for any medicinal or pharmaceutical purpose to which the solution is applied may be neglected. By the process of the London College, the product will probably be less perfect, both from the proportion of lime being less, and from no peculiar arrangement being employed to favour its action. The agency of the air must be excluded during the filtration, especially from the filtered liquid, to prevent absorption of carbonic acid; and for the same reason it must, after it is prepared, be kept in glass vessels well stopt. The medicinal applications of the alkali under this form have been already considered.

Potassa, *olim Causticum Commune Acerrimum.* Potash. Ed.

"Take of Water of Potash, any quantity. Evaporate it in a covered clean iron vessel, until, when the ebullition is finished, the saline matter flow smoothly like oil, which will happen before the vessel is at a red heat. Then pour it on a clean iron plate; cut it into small masses before it hardens, and immediately put them into a phial well stopt."

Potassa Fusa. Fused Potash. Lond.

"Take of Liquor of Potash, a gallon. Evaporate the water in a clean

iron vessel, until the ebullition ceasing, the potash liquefies: then pour it upon an iron plate into proper moulds."

Kali Causticum. Caustic Kali. Dub.

"Take of Water of Caustic Kali, any quantity. Evaporate it in a very clean iron vessel, until the ebullition having ceased, the saline matter, on increasing the heat, nearly remains tranquil in the vessel. Pour out this melted salt on an iron plate, and while it is becoming concrete, cut it into proper pieces, which put immediately into a phial well stopt.

"During the evaporation, the evaporator should avoid the drops of liquid thrown out from the vessel."

By the dissipation of the water in this process, the alkali is obtained in a solid form, though it still retains a quantity of water in intimate combination: it is usually run into moulds, so as to be formed into cylindrical pieces. Under this form it is used as a caustic: it quickly erodes animal matter, and, mixed with soap into a paste, is sometimes used to open an ulcer.

Potassa cum Calce, *olim Causticum Commune Mitius*. Potash with Lime. Ed.

"Take of Water of Potash, any quantity. Evaporate it to one-third in a covered iron vessel; then mix with it as much newly slaked lime as may be sufficient to give it the consistence of a solid paste, which is to be kept in a stopt vessel."

Potassa cum Calce. Potash with Lime. Lond.

"Take of the Liquor of Potash, three pints; of newly Prepared Lime, a pound. Boil the liquor of potash to a pint; then add the lime slaked by the water having been poured upon it, and mix them carefully."

Kali Causti cum Calce. Caustic Potash with Lime. Dub.

"Evaporate the Water of Caustic Potash to a third part; then add of recently Calcined Lime reduced to powder, as much as may form a mass of a proper consistence, which is to be kept in a vessel well stopt."

As a caustic, this is milder than the former preparation, and it is less deliquescent, so that it can be more easily confined to the part to which it is applied. When mixed, however, with the requisite quantity of soap to form a paste, it is scarcely sufficiently active.

Aqua Supercarbonatis Potassæ. Water of Supercarbonate of Potash. Ed.

"Take of water, ten pounds; Pure Subcarbonate of Potash, one ounce. Dissolve, and expose the solution to the current of Carbonic Acid Gas, which arises from three ounces of Powder of Carbonate of Lime, three ounces of Sulphuric Acid, and three pounds of Water, gradually and cautiously mixed. The chemical apparatus invented by Dr. Nooth is well adapted to this preparation. But if a larger quantity of the solution is required, an apparatus which gives sufficient pressure will be necessary. It ought to be kept in vessels well stopt."

Potash, when used as a lithontriptic, excites so much irritation in the stomach and bladder, that its use cannot be long continued. But, when supersaturated with carbonic acid, as it is in this preparation, it is rendered more pleasant and less irritating; and though its lithontriptic or real solvent power is diminished, it is capable of acting as a palliative, and of being continued for any length of time. From the observations already made under the class of lithontriptics, it follows, that no greater benefit is to be

expected from the use of alkaline remedies under any form, and that this has even some peculiar advantages. It is taken to the extent of one, or even two pounds in the day. It affords also a grateful antacid. A solution of this kind has been in use for a considerable time; and to establish uniformity in its strength, it is inserted by the Edinburgh College as an officinal preparation. When properly prepared, it is pungent and acidulous, and sparkles when poured into a glass. By employing an apparatus, in which strong mechanical pressure can be applied, the solution may be still more impregnated with carbonic acid: it is thus rendered more grateful, and as an antacid, in particular, is perhaps rendered more effectual, the stimulus of the carbonic acid relieving the uneasy sensations connected with acidity of the stomach, while the alkali neutralizes the acid. It is often prepared in the shops with too small a proportion of alkali.

Acetas Potassæ. Acetate of Potash. Ed.

"Take of pure Subcarbonate of Potash, one pound; Weak Acetic Acid, as much as is necessary. Boil it with a gentle heat in five pounds of the acid, and add more acid at different times, until, on the watery part of the former portion being nearly dissipated by evaporation, the acid newly added excite no effervescence: this will happen when about twenty pounds of acid have been consumed. Afterwards evaporate to dryness slowly. Let the remaining impure salt be liquefied with a gentle heat, for a short time, but not too long; then dissolved in water, and strained through paper. If the liquefaction has been properly done, the strained liquor will be limpid; if not of a brown colour. Afterwards evaporate with a very gentle heat this liquor, in a shallow glass vessel, so that when removed from the fire it may form a crystalline mass. Lastly, the acetate of potash ought to be kept in vessels well closed."

Potassæ Acetas. Acetate of Potash. Lond.

"Take of Subcarbonate of Potash, a pound and a half; of Acetic Acid, a gallon. Mix them together in a large glass vessel, and the liquor being evaporated to one half, drop in gradually of acetic acid as much as may be sufficient to full saturation. Let the liquor be again evaporated to a half, and strained; then evaporate in a water-bath, so that on being removed from the fire it may pass into crystals."

Acetas Kali. Acetate of Potash. Dub.

"Take of Subcarbonate of Potash, any quantity. Add to it, at different times, of Distilled Vinegar, moderately heated, rather more than five times its weight. When the effervescence has ceased, and the liquor has been partly evaporated, add again at intervals Distilled Vinegar, until the mixture ceases to effervesce; the evaporation being continued, a dry salt will be produced, which, increasing the heat a little, liquefy cautiously. Dissolve it when cold in water, strain the liquor, and boil it down, until, when removed from the fire, in cooling it pass into a mass of crystals perfectly white. Put these immediately into phials well stopt."

In this process, the acetic acid of the distilled vinegar combines with the potash, disengaging the carbonic acid. The acetate of potash, obtained by the evaporation, is liable to be of a brownish colour, from the presence of a little extractive matter, derived from the vinegar. It is freed from this either by boiling the solution with charcoal powder, or, as directed in the Pharmacopœia, by melting the salt; and, by the second solution and evaporation, it is obtained in the form of a white foliated mass; the foliated structure, which is very characteristic of it, arising from a species of crystallization.

Acetate of potash is very deliquescent, becoming humid in a short time from exposure to the air. It does not require so much as half its weight of water for its solution, at the temperature of 60°; it proves moderately laxative, and was at one time celebrated as a diuretic, in a dose of one or two drachms; but it has fallen into disuse.

Sulphas Potassæ. Sulphate of Potash. Ed.

"Dissolve the acidulous salt, which remains after the distillation of nitrous acid, in warm water, and after removing the superfluous acid by the addition of carbonate of lime, set it aside until the impurities subside; then pour off the fluid, filter it, and evaporate, so that crystals may be formed."

Potassæ Sulphas. Sulphate of Potash. Lond.

"Take of the Salt which remains after the distillation of Nitric Acid, two pounds; of Boiling Water, two gallons. Mix them that the salt may be dissolved; then add of Sub-carbonate of Potash, as much as will be sufficient to saturate the acid. Afterwards boil it until a pellicle appear on the surface, and when strained put it aside, that crystals may be formed. Having poured off the water, dry them on bibulous paper."

Sulphas Kali. Sulphate of Potash. Dub.

"Dissolve the Salt which remains after the distillation of Nitrous Acid, reduced to powder, in a sufficient quantity of boiling water; add as much Pearl-ash as may be necessary to saturate the superfluous acid. The liquor being strained, evaporate it with a moderate heat, so that crystals may form."

In the edition before the last of the Edinburgh Pharmacopœia, two processes were given for the formation of this salt, one, the same as is given in the present, the other as follows: "To any quantity of Sulphuric Acid, diluted with six times its weight of water, in a large glass vessel, Carbonate of Potash diluted with the same quantity of water was added to saturation. When the effervescence was over, the liquor was strained and set aside to crystallize." In which process the sulphuric acid unites with the potash of the carbonate of potash, and expels the carbonic acid with effervescence, the sulphate of potash remaining in solution. The process in the present edition, which is that also of the other Pharmacopœias, being more economical, is always followed. The salt remaining after the distillation of nitrous acid is sulphate of potash with an excess of sulphuric acid: this is neutralized by the potash of the carbonate of potash. The neutral salt forms in small crystals, the figure of which is a four-sided or six-sided prism, acuminated by four or six planes; by slow evaporation they are obtained of a larger size. They require seventeen parts of cold water for their solution. The taste of the salt is bitter. Its powers are those of a cathartic, in the dose of half an ounce; but it is more usually given in smaller doses as an aperient, and, from its sparing solubility, is given usually in powder, and frequently in combination with some of the vegetable purgatives.

Sulphas Potassæ cum Sulphure. Sulphate of Potash with Sulphur. Ed.

"Take of Nitrate of Potash in powder, Sublimed Sulphur, equal weights. Throw them, well mixed together, in small quantities at a time, into a red-hot crucible. The deflagration being finished, let the salt cool, and keep it in a glass phial, well stopt."

The nitrate of potash being decomposed at a red heat, affords oxygen

to the sulphur, in such proportions as to convert it principally into sulphuric, and partly into sulphurous acids. Both acids are attracted by the potash; and from the rapidity of the deflagration, a portion of the sulphur even escapes oxygenation, and remains united with a portion of the alkali in the state of sulphuret. This is therefore a mingled product. In its medicinal qualities, it does not appear to differ much from the sulphate of potash; it is employed like it as an aperient, and its sulphurous taste and odour, when it is dissolved, give its solution some resemblance to the sulphurous saline mineral waters. Hence either alone, or mixed with sulphate of magnesia, it is sometimes used as affording an imitation of them.

POTASSÆ SUPERSULPHAS. Supersulphate of Potash. Lond.

"Take of the Salt which remains after the distillation of Nitric Acid, two pounds; Boiling Water, four pints. Mix them, so that the salt may be dissolved, and strain. Then boil the solution to one half, and put it aside that crystals may form. The liquor being withdrawn, dry these on bibulous paper."

By solution in water, the free acid of the residual mass is in part removed, but the salt still crystallizes with excess of acid. It is more soluble than the neutral sulphate, but it is not apparent to what medicinal use it can be applied with any peculiar advantage; and it is liable to variation in its composition, from the extent of evaporation, and other circumstances connected with its formation.

TARTRAS POTASSÆ. Tartrate of Potash. Ed.

"Take of Subcarbonate of Potash, one part; Supertartrate of Potash, three parts, or as much as may be necessary; Boiling Water, fifteen parts. To the subcarbonate of potash dissolved in the water, add, by small quantities, the Supertartrate of Potash rubbed to a fine powder, as long as it excites effervescence, which generally ceases before three times the weight of the subcarbonate of potash have been thrown in. Then strain the liquor, when cold, through paper; and after due evaporation, put it aside that crystals may form."

POTASSÆ TARTRAS. Tartrate of Potash. Lond.

"Take of Subcarbonate of Potash, sixteen ounces; of Supertartrate of Potash, three pounds; of Boiling Water, a gallon. Dissolve the subcarbonate of potash in the water; then add the supertartrate of potash in powder, until ebullition is no longer excited. Strain the liquor through paper; afterwards boil it until a pellicle appear, and put aside, that crystals may form. Having poured off the liquor, dry them on bibulous paper."

TARTARAS KALI. Tartrate of Potash. Dub.

"Take of Subcarbonate of Potash, a pound; Crystals of Tartar in fine powder, two pounds and a half, or as much as may be necessary to saturate the potash; Boiling Water, a gallon. To the subcarbonate of potash dissolved in the water, add the tartar gradually. Evaporate the liquor strained through paper, and put it aside that crystals may form by cooling."

The excess of tartaric acid in the supertartrate of potash is in this process saturated by the potash of the carbonate of potash, and the proper neutral salt is formed. Though ordered to be crystallized in all the Pharmacopœias, the crystallization of it can scarcely be accomplished by hasty evaporation. In its preparation, therefore, the solution is usually evaporated to dryness, and it is kept in powder in the shops.

This salt has a bitter taste; it is very soluble in water, requiring only

four parts of cold water for its solution; and from this greater solubility compared with that of the supertartrate, it derived its name of Soluble Tartar: it is slightly deliquescent. The portion of alkali producing neutralization is retained by a very weak affinity: even the weaker acids decompose it partially, and reduce it to the state of supertartrate, a circumstance requiring to be attended in combining it in prescriptions. As a mild purgative, it is given in the dose of one ounce.

Carbonas Sodæ. Carbonate of Soda Ed.

"Take of Subcarbonate of Soda, two parts; Water, three parts; dissolve the salt in the water, and expose it to a stream of carbonic acid gas until it cease to absorb any acid: then strain the liquor, and reduce it to crystals by evaporation, by a heat not greater than 180°.

"Carbonic acid is easily procured from equal weights of Carbonate of Lime in powder and Sulphuric Acid copiously diluted."

Sodæ Carbonas Carbonate of Soda. Lond.

"Take of Subcarbonate of Soda, a pound; Subcarbonate of Ammonia, three ounces; Distilled Water, a pint. To the subcarbonate of soda dissolved in the water, add the ammonia; then by a sand-bath apply a heat of 180° for three hours, or until the ammonia is expelled, and put it aside that crystals may form. Let the remaining liquor be evaporated in a similar manner, and put aside that crystals may again be produced."

The subcarbonate of soda receives in this process carbonic acid from the carbonate of ammonia, while the ammonia is expelled by the heat. The quantity of carbonate of ammonia employed is unnecessarily large, and even with this excess, the neutralization of the soda is imperfect, being probably counteracted by the heat applied. The saturation is effected more directly and economically, by transmitting a current of carbonic acid gas through the solution of the subcarbonate, as is ordered in the Edinburgh Pharmacopœia. The salt in this state contains twice the quantity of carbonic acid that the common subcarbonate does; it is therefore named the Bi-carbonate. Though not perfectly neutral, it is milder than the subcarbonate; it is therefore more grateful when used as an antacid dissolved in water; and from the larger quantity of carbonic acid it contains, it is also better adapted to the preparation of the effervescing draught.

Subcarbonas Sodæ. Subcarbonate of Soda. Ed.

"Take of Impure Subcarbonate of Soda, any quantity. Bruise it, and boil it in water until all the saline matter is dissolved. Strain the solution through paper, and evaporate it in an iron vessel, so that after cooling crystals shall form."

Sodæ Subcarbonas. Subcarbonate of Soda. Lond.

"Take of Impure Soda rubbed to powder, a pound; of Distilled Boiling Water, four pints. Boil the soda in the water for half an hour, and strain. Evaporate to two pints, and put aside, that crystals may form. Reject the residual liquor."

Subcarbonas Sodæ. Subcarbonate of Soda. Dub.

"Take of Barilla in powder, ten pounds; Water, two gallons. Boil the barilla in the water for two hours in a close vessel, agitating frequently; strain the liquor, and the residuum of the barilla being again rubbed, boil in an equal quantity of water; repeat this a third time. The leys being strained and mixed, are to be evaporated to dryness in an open iron vessel, taking care that the heat is not raised so high as to liquefy the saline mat-

ter which remains; stir this with an iron spatula until it become white: lastly, dissolve it in boiling water, and after due evaporation, put it aside, that by slow cooling, crystals may form. These will be purer, if before each boiling the barilla be exposed for some time to the air. The crystals ought to be formed when the temperature of the air is nearly that of freezing water, and the specific gravity of the liquor is to that of distilled water as 1220 to 1000. If the salt is not sufficiently pure, repeat the solution and crystallization."

The barilla of commerce, from which this salt is ordered to be prepared, is the residual matter of the combustion of marine plants. It is an impure subcarbonate of soda, containing large quantities of other saline and earthy matter, chiefly sulphate and muriate of soda, lime, magnesia, argil, and silex, with charcoal. The subcarbonate of soda crystallizing readily, the solution on being evaporated affords it nearly pure in the crystals which first form. The residual liquor, containing more of the other salts, ought to be rejected, a direction properly given in the formula of the London Pharmacopœia. From three to five ounces of the crystallized salt are obtained from a pound of barilla. Though mild to the taste, it is sensibly alkaline, and changes the vegetable colours to a green. It crystallizes in octohedrons; its crystals are efflorescent; they require not more than twice their weight of cold water for their solution; and by a heat inferior to that of 212° are liquefied by the action of the large quantity of water of crystallization they contain. Its quantity amounts to 64 parts in 100, with 21.6 of soda, and 14.4 of carbonic acid. The use of this salt as a lithontriptic has been already stated, and lately it has been highly recommended in hooping-cough, in doses of ten grains to one drachm, given thrice a day.

Sodæ Subcarbonas Exsiccata. Dried Subcarbonate of Soda. Lond.

"Take of Subcarbonate of Soda, a pound. Submit it to the heat of boiling water in a clean iron vessel until it is perfectly dry, stirring it constantly with an iron spatula. Then rub it into powder."

Carbonas Sodæ Siccatum. Dried Carbonate of Soda. Dub.

"Liquefy the crystals of Carbonate of Soda in a silver crucible placed on a fire: then increase the heat, and stir the melted salt, until, by the evaporation of its water, it become dry. This being rubbed to powder, is to be kept in close phials."

Carbonate of soda has been given as a lithontriptic, mixed with soap, under the form of pill. If the crystallized salt be used, besides the addition to its bulk from the water of crystallization, it effloresces, so that the pill prepared from it loses its cohesion. The dried carbonate is therefore preferable; and from the moderate heat to which it is exposed in the drying, the water only is expelled, without any change in the composition of the salt. According to Kirwan, it consists of 40.14 of acid, and 59.86 of soda.

Aqua Supercarbonatis Sodæ. Water of Supercarbonate of Soda. Ed.

"This is to be prepared from ten pounds of Water, and two ounces of Subcarbonate of Soda, in the same manner as the Water of Supercarbonate of Potash."

The proportion of the carbonate to the water is greater in this preparation than in that of the supercarbonate of potash water; but this is owing

to the carbonate of soda containing so much water of crystallization, that even with the enlarged proportion, there is not more real alkali in the one than in the other. The supercarbonated soda water is used as a lithontriptic in the same dose as the supercarbonated potash water, and is usually preferred, on the supposition of being more pure and mild. It is also in common use as an antacid, applications of it which have been already noticed.

Tartras Sodæ et Potassæ. Tartrate of Soda and Potash.

"This is prepared from Carbonate of Soda and Supertartrate of Potash, in the same manner as Tartrate of Potash."

Soda Tatarizata. Tartarized Soda. Lond.

"Take of Subcarbonate of Soda, twenty ounces; of Supertartrate of Potash in powder, two pounds; of Boiling Water, ten pints. Dissolve the subcarbonate of Soda in the water, and gradually add the supertartrate of potash. Strain the liquor through paper, then boil it, until a pellicle appear, and put aside that crystals may form. Having poured off the water, dry them on bibulous paper."

Tartaras Sodæ et Kali. Tartrate of Soda and Potash. Dub.

"Take of Carbonate of Soda, twenty ounces; Crystals of Tartar, rubbed to a fine powder, two pounds; Distilled Boiling Water, ten pints. To the carbonate of soda dissolved in the water, add gradually the tartar; the liquor being strained through paper, evaporate, and put it aside, that on slow cooling, crystals may form."

The excess of tartaric acid in the supertartrate of potash, being saturated in this preparation by the soda of the carbonate of soda, a triple salt is formed, properly named Tartrate of Potash and Soda. It crystallizes in rhomboidal prisms; is soluble in five parts of water at 60°, and has a bitter saline taste. It consists, as Vauquelin has stated its composition, of 54 parts of tartrate of potash, and 46 of tartrate of soda. It is employed as a cathartic, in the dose of one ounce, being given dissolved in tepid water, with frequently the addition of manna and of peppermint water, or tincture of cardamom; and is often preferred, as being less disagreeable than the greater number of the saline cathartics.

Phosphas Sodæ. Phosphate of Soda. Ed.

"Take of Bones, burnt to whiteness, and reduced to powder, ten pounds; Sulphuric Acid, six pounds; Subcarbonate of Soda, as much as may be necessary. Mix the powder in an earthen vessel with the sulphuric acid; then add nine pounds of Water, and again mix them. Keep the vessel in the vapour arising from boiling water for three days; after which, dilute the matter, by adding other nine pounds of Boiling Water, and strain through a strong linen cloth; then pour over it gradually, boiling water, until the whole phosphoric acid is washed out. Put aside the strained liquor, that the impurities may subside, from which pour it off, and, by evaporation, reduce it to nine pounds. To this liquor, again poured off from the impurities, and heated in an earthen vessel, add the Subcarbonate of Soda dissolved in warm water, until the effervescence cease. Then strain, and put it aside that crystals may form. These being removed, add, if necessary, to the liquor, a little Subcarbonate of Soda, that the phosphoric acid may be exactly saturated; and prepare it, by evaporation, again to form crystals, as long as these can be produced. Lastly, let the crystals be kept in a vessel well stopt."

PHOSPHAS SODÆ. Phosphate of Soda. Dub.

"Take of burnt bones, beat to powder, five pounds; Sulphuric Acid, three pounds and a half. Mix the powder with the sulphuric acid, in an earthen vessel; add gradually five pints of water, and stir the mixture. Digest for three days, adding occasionally more water, lest the matter become dry, and continue the stirring; then pour upon it five pints of boiling water, and strain through a linen cloth, pouring on boiling water repeatedly, until the acid is entirely washed out. Put aside the liquor that the impurities may subside, then pour it off pure, and reduce it by evaporation to one half. Lastly, add carbonate of Soda, (dissolved in a sufficient quantity of warm water), three pounds and ten ounces; strain, and by repeated evaporation and cooling, form crystals, which are to be kept in a vessel well stopt. If the salt is not sufficiently pure, repeat the solution and crystallization."

The white residuum of burnt bones consists chiefly of phosphate of lime. The sulphuric acid decomposes it, by combining with the lime; the decomposition, however, is only partial; the phosphoric acid which is disengaged, in conformity to the law of chemical attraction, which is observed in many cases of this kind, retaining a quantity of the lime combined with it, and forming a soluble compound. When carbonate of soda is added to the acidulous liquor obtained by washing the materials, the soda combines with the free phosphoric acid, and the lime retaining as much phosphoric acid in combination as forms neutral phosphate of lime, is precipitated; the phosphate of soda crystallizes on evaporation of the strained liquor. Its crystals are rhomboidal prisms, but they are obtained of a regular figure only in crystallizing with a slight excess of alkali. Hence the liquor should be slightly alkaline; and from the tendency of the salt to crystallize with an excess of base, it is necessary, though the neutralization may have been perfect, to add, previous to the second crystallization, a little carbonate of soda, as directed in the formula of the Edinburgh Pharmacopœia. The crystals are efflorescent; they are soluble in little more than three parts of cold, and in half that quantity of boiling water. They consist, according to Thenard, of 19 of soda, 15 of acid, and 66 of water. The taste of this salt is purely saline, without any bitterness; its medicinal operation is that of a mild cathartic, and, from being less nauseous to the taste than the other salts, it is entitled to preference. Its dose is one ounce, given generally dissolved in six ounces of tepid water, with the addition of a little peppermint, or any other grateful aromatic.

SULPHAS SODÆ. Sulphate of Soda. Ed.

"Dissolve the Acidulous Salt, which remains after the distillation of Muriatic Acid, in Water; and add to it, Carbonate of Lime in powder, to remove the superfluous acid. Put it aside until the impurities have subsided; then having poured off the liquor, and strained it through paper, reduce it by evaporation, that crystals may be formed."

SULPHAS SODÆ. Sulphate of Soda. Lond.

"Take of Salt which remains after the distillation of Muriatic Acid, two pounds; of Boiling Water, two pints and a half. Dissolve the salt in the water; then add gradually of Subcarbonate of Soda, as much as will be sufficient to saturate the acid. Boil until a pellicle appear, and when the liquor is strained, put it aside, that crystals may form. Having poured off the water, dry them on bibulous paper."

SULPHAS SODÆ. Sulphate of Soda. Dub.

"Dissolve the Salt which remains after the distillation of Muriatic Acid in a sufficient quantity of boiling water. Put aside the strained liquor after due evaporation, that crystals may form by slow cooling."

In the decomposition of muriate of soda by sulphuric acid, to prepare muriatic acid, more sulphuric acid is used than is necessary to saturate the soda, advantage being gained from its quantity adding to its affinity, as has been already explained; hence the necessity of removing the excess of acid in the residual mass, to obtain the neutral sulphate. In the Edinburgh Pharmacopœia, this is ordered to be done by carbonate of lime. The London College order the excess of acid to be neutralized by carbonate of soda, on the supposition of its being more economical, as increasing the quantity of salt, but from the price of the soda it is less so. Slaked lime is preferable to either, as it decomposes a little muriate of iron, which adheres to the salt. This salt is also obtained as a residuum in some other processes, particularly in the preparation on a large scale of muriate of ammonia, the Sal Ammoniac of commerce. It crystallizes in hexaedral prisms; they are efflorescent and soluble in rather less than three parts of cold water. They consist of 18.48 of soda, 23.52 of acid, and 58 of water. Sulphate of soda has long been in use as a cathartic: it operates with sufficient power and certainty, but is liable to occasion nausea, from its very bitter taste. Its medium dose is an ounce and a half.

Murias Sodæ Siccatum. Dried Muriate of Soda. Dub.

"Take of Muriate of Soda, any quantity. Calcine it over the fire in an iron vessel, lightly covered, until it cease to decrepitate, stirring it occasionally."

This is designed merely to prepare the muriate of soda for the process of the distillation of muriatic acid, as already noticed.

Subcarbonas Ammoniæ. Subcarbonate of Ammonia. Ed.

"Take of Muriate of Ammonia, one part; Soft Carbonate of Lime dried, two parts. Each being separately reduced to powder, mix them, and sublime from a retort into a receiver kept cold."

Ammoniæ Subcarbonas. Subcarbonate of Ammonia. Lond.

"Take of Muriate of Ammonia, a pound; of Prepared Chalk dried, a pound and a half. Rub them separately to powder, then mix, and sublime with a heat gradually increased, until the retort is red."

Subcarbonas Ammoniæ. Subcarbonate of Ammonia. Dub.

"Take of Muriate of Ammonia, reduced to powder and well dried, Carbonate of Soda dried, of each half a pound. Put them mixed together into an earthen retort, and sublime with a heat gradually raised into a receiver kept cold."

In this process, as given in the two first formulas, the muriatic acid of the muriate of ammonia combines with the lime of the carbonate of lime, and the carbonic acid of the latter unites with the ammonia of the former; the exertion of these new affinities being determined by the heat applied. The carbonate, or rather subcarbonate of ammonia which is formed, is sublimed, and is obtained in a crystalline cake. When the process is carried on in the large way, the sublimation is generally performed from an iron pot, to which the heat is directly applied, and which is connected with a large earthen or leaden receiver. The Dublin College, in place of carbonate of lime, order carbonate of soda; with this the appli-

cation of so high a heat will not be required; but not being sufficiently economical, the direction will not be attended to by the practical chemist. The proportion of carbonate of lime ordered by the Edinburgh, and formerly also by the Dublin College, but now corrected by the latter, is probably too large, and the excess, by adding to the mass of materials, adds to the expense of the vessels and fuel.

According to the experiments of Davy, the proportions of the ammonia and carbonic acid in this product are different, according to the heat applied in its preparation; they vary so much as from 20 to 50 parts of ammonia in 100, the ammonia being in larger proportion, as the temperature at which the product has been formed is high; that formed at a temperature of 300° containing 50 parts of alkali, while that produced at a temperature of 60° contains only 20 parts. Its smell is pungent and ammoniacal, and it changes the vegetable colours to a green; it is very volatile, abundantly soluble in water, and is efflorescent on exposure to the air. Its medicinal uses are as a stimulant applied to the nostrils in fainting, and as a stimulant and diaphoretic, taken internally, in a dose of from five to fifteen grains. It has been employed with some advantage too in scrofula, combined with bitters.

Solutio Subcarbonatis Ammoniæ. Solution of Subcarbonate of Ammonia. Ed.

"Take of Subcarbonate of Ammonia, one part; Distilled Water, four parts. Dissolve the subcarbonate in the water, and strain through paper."

Liquor Ammoniæ Subcarbonatis. Liquor of Subcarbonate of Ammonia. Lond.

"Take of Subcarbonate of Ammonia, four ounces; of Distilled Water, a pint. Dissolve the carbonate of ammonia in the water, and strain through paper."

Aqua Carbonatis Ammoniæ. Water of Carbonate of Ammonia. Dub.

"Take of Muriate of Ammonia, a pound; Carbonate of Soda, twenty-eight ounces; Water, three pints. Distil two pints with a fire gradually raised.

"The specific gravity of this liquid is to that of distilled water as 1095 to 1000."

In this preparation of carbonate of ammonia in the humid way, carbonate of lime, from its insolubility, could not be employed to decompose the muriate of ammonia, as it is in the dry way; an alkaline carbonate is therefore employed. The alkali, whether potash or soda, attracts the muriatic acid, while the ammonia combines with the carbonic acid. The carbonate, or rather subcarbonate of ammonia, is volatilized and dissolved by the watery vapour. From the substitution of carbonate of soda for that of potash by the Dublin College, a larger quantity of carbonic acid will probably be combined with the ammonia.

The formula of the London and Edinburgh Colleges, in which the proper proportion of the carbonate of ammonia to the water is now given, is of easiest execution.

Water of carbonate of ammonia is applied to the same medicinal purposes as the concrete carbonate, and being more convenient, is generally prescribed for internal use.

Liquor Volatilis Cornu Cervini. Volatile Liquor of Hartshorn. Dub.

"Take of Hartshorn, any quantity. Put it into a retort, and distil, with a heat gradually raised, a volatile liquor, salt, and oil. Distil the

volatile liquor repeatedly until it become limpid as water, separating, after each distillation, the salt and oil by filtration. The liquor will be purified more easily, if, after each distillation except the first, there be added to it a sixth part of its weight of charcoal, previously made red hot, extinguished by being covered with sand, and reduced to powder while hot. If hartshorn cannot be procured in sufficient quantity, the bones of any land animals may supply its place."

This is a process which has long been employed in Pharmacy. The animal matter, principally the gelatin of the bones, at an elevated temperature, suffers decomposition, and its principles enter into new combinations, forming chiefly carbonate of ammonia and empyreumatic oil. The carbonate of ammonia is partly dissolved by the water which distils over, and obtained partly in a concrete state, forming what used to be named Spirit, and Salt of Hartshorn. It is always contaminated, however, with the empyreumatic oil, which renders it nauseous; and though at one time it was supposed, from this impregnation, to be possessed of some peculiar virtues, this probably had no just foundation, and it is now rejected from practice. If sublimed from charcoal powder, the oily matter is completely removed; but then it differs in nothing from the carbonate of ammonia obtained by the preceding processes, and the process, with these repeated operations, is not more economical.

Aqua Ammoniæ. Water of Ammonia. Ed.

"Take of Muriate of Ammonia, one pound; Lime, recently prepared, a pound and a half; Distilled Water, one pound; Water, nine ounces. Pour the water upon the lime bruised in an iron or earthen vessel, closing the vessel until the lime, having fallen into powder, has become cold; then mix the muriate, beat to a very fine powder, with the lime, rubbing them together in a mortar, then put them into a retort of glass. Let the retort be placed in a sand-bath, and connect with it a receiver furnished with a tube, which is to be inserted almost to the bottom of the phial containing the distilled water; the phial, however, should be capable of containing double the quantity. Then apply the fire, increasing gradually until the bottom of the iron pot is at a red heat, and as long as the ammonia is produced.

"The specific gravity of this water is to that of distilled water as 0.939 to 1000. It should be preserved in vessels well closed."

Liquor Ammoniæ. Liquor of Ammonia. Lond.

"Take of Muriate of Ammonia, eight ounces; newly prepared Lime, six ounces; Water, four pints. Pour a pint of the water on the lime; cover the vessel, and put it aside for an hour, then add the muriate of ammonia, and the rest of the water previously heated, and again cover the vessel; strain the liquor after it has cooled; then distil twelve fluidounces of liquor of ammonia.

"The specific gravity of this liquor is to that of distilled water as 0.960 to 1000."

Aqua Ammoniæ Causticæ. Water of Caustic Ammonia. Dub.

"Take of Muriate of Ammonia, sixteen ounces; recently Calcined Lime, two pounds; Water, six pints.—Sprinkle on the lime, put into an earthen vessel, a pound of water, and close the vessel. After twenty-four hours, mix the salt with the lime now fallen into powder, avoiding the vapours; then put the mixture into a retort, and pour upon it the rest of the water. After agitation, distil with a moderate heat, into a receiver kept

cold, twenty ounces by measure of liquor, having secured well the joinings of the vessels by lute.

The specific gravity of this liquor is to that of distilled water as 936 to 1000."

In these processes, the lime combines with the muriatic acid of the muriate of ammonia, and the ammonia is disengaged. Being permanently elastic, it is condensed only by combination with water, and this is effected either by distilling water at the same time from the materials, or by transmitting the ammoniacal gas through water. The Edinburgh College employ the latter mode, and a solution is obtained in this way, perhaps more strongly impregnated; the other is more easily conducted, and affords a product sufficiently strong for any medicinal or pharmaceutical purpose. The process of the London Pharmacopœia is one lately introduced in the place of another extremely injudicious. It has the peculiarity that the lime is not put into the retort, but is mixed with the muriate of ammonia and the water, and the liquor from this mixture is distilled. It might be doubted *à priori*, whether in this way a sufficient quantity of lime will be taken up to decompose the whole of the muriate of ammonia. From lime, however, forming a soluble ternary compound with ammonia and muriatic acid, this may be the case; the application of the heat will then subvert this combination, and expel the ammonia, which the water rising in vapour will condense. If this process succeeds, it must be preferable to any other, both as diminishing the bulk of the materials affording the product, and as it is very difficult, when the lime is put into the retort, to extract the residual mass after the distillation.

When this process is conducted on a large scale, an iron still is employed, into which the materials are put, and to which the fire can be directly applied; the head of the still being connected with a spiral tube placed in a refrigeratory, to the extremity of which, besides the recipient to collect the condensed product, two or three receivers are adapted, containing water to absorb any ammoniacal gas. A modification of this apparatus might be advantageously used on a small scale, or it might be economical to expose the dry mixture of the muriate and the lime to heat in an iron bottle, and condense the ammoniacal gas by receiving it in water.

Water, under a common atmospheric pressure, and at a temperature below 50°, absorbs about one-third of its weight of gas; and by this combination its specific gravity is diminished, that of the saturated solution being not more than 9054. It is seldom so completely impregnated. By the mode directed by the Dublin College, which is that usually followed, the solution is obtained of the specific gravity of 936; and when of this strength, it contains about 16 of ammonia in 100 parts. Its smell is strong and pungent; its taste is extremely acrid, and it inflames the skin. Though its odour is pungent, it ought to be free from any fœtor. It is employed in medicine as a stimulant and diaphoretic, internally, in a dose from twenty to thirty drops, and sometimes as an emetic in a larger dose diluted with water. Externally it is used as a stimulant applied to the nostrils, and as a rubefacient; with the latter intention it is applied mixed with oil, or with soap liniment.

Aqua Ammonia Diluta. Dilute Water of Ammonia. Ed.

"Take of Water of Ammonia, one part. Distilled Water, two parts. Mix them."

This affords a sufficiently dilute preparation of the water of ammonia, which could not formerly be used as ordered to be prepared in the Pharmacopœias, owing to the great acrimony it possessed.

ALCOHOL AMMONIATUM. Ammoniated Alcohol. Ed.

"Take of stronger alcohol, thirty-two ounces; recently prepared Lime, twelve ounces; Muriate of Ammonia, eight ounces; Water, six ounces. From these, prepare the Ammoniated Alcohol in the same manner as the water of ammonia, and preserve in a similar manner."

SPIRITUS AMMONIÆ. Spirit of Ammonia. Dub.

"Take of Proof-Spirit three pints; Muriate of ammonia, four ounces; Pearl-ash, six ounces. Mix and distil two pints with a moderate heat."

SPIRITUS AMMONIÆ. Spirit of Ammonia. Lond.

"Take of Proof-Spirit, two pints; Liquor of Ammonia, one pint. Mix them."

In the process of the Edinburgh Pharmacopœia, the *lime* combining with the muriatic acid of the muriate, disengages the ammonia which is condensed by the alcohol. In that of the Dublin Pharmacopœia, which had also a place in a former edition of the Edinburgh, the decomposition is produced by the subcarbonate of potash. A subcarbonate of ammonia is thus disengaged with a considerable excess of ammonia: in this state it is dissolved by the alcohol, especially as the distillation is continued until a spirit weaker than alcohol is distilled over; and the more watery portion of this, towards the end of the distillation, dissolves a portion of subcarbonate of ammonia, which at that stage of the process condenses in a concrete form, on the sides of the receiver. The London College give a process for preparing it, by mixing alcohol with strong water of ammonia. There is one circumstance which may render it doubtful, whether the alteration by the Edinburgh College is an improvement,—that when the spirit is impregnated with pure ammonia, the ammonia from its volatility is liable to escape, especially when the impregnated spirit is employed to form tinctures, which in the shops are often kept for a long time, and in bottles not perfectly closed. When the ammonia is in the state of subcarbonate, this inconvenience is in some measure avoided, and the preparation is also less acrid. Mr. Phillips proposed a process for obtaining this impregnation, more economical than the old process,—distilling alcohol from the common subcarbonate of ammonia with the addition of a little water; a portion of carbonic acid appears to be expelled by the heat, and the ammonia retains only so much as to be still soluble in the alcohol. It might be more economical, and afford a product rather more strongly impregnated, to distil the alcohol from the subcarbonate of ammonia, with the addition of a little water of pure ammonia. If the object be however to obtain alcohol impregnated with pure ammonia, the process of the Edinburgh or Dublin Pharmacopœia is to be employed.

Ammoniated alcohol has the pungent smell, and retains all the powers of ammonia. It is used principally as the menstruum of some vegetables with which ammonia coincides in medicinal operation.

AQUA ACETATIS AMMONIÆ. Water of Acetate of Ammonia. Ed.

"Take of Carbonate of Ammonia, any quantity in powder. Pour upon it as much acetic acid as may be sufficient to saturate the ammonia exactly."

LIQUOR AMMONIÆ ACETATIS. Liquor of Acetate of Ammonia. Lond.

"Take of Subcarbonate of Ammonia, two ounces; Acetic Acid, four

pints. Add the acid to the carbonate of ammonia, until effervescence is no longer excited, and mix them."

AQUA ACETATIS AMMONIÆ. Water of Acetate of Ammonia. Dub.

"Take of Carbonate of Ammonia, two ounces; add gradually, agitating occasionally, of Distilled Acetic Acid, three pounds and a half, or as much as may be necessary to saturate the ammonia; ascertaining this by the test of litmus."

The acetic acid combines with the ammonia of the carbonate of ammonia, disengaging the carbonic acid with effervescence; and the acetate of amnonia being a very soluble salt, remains dissolved in the water. As much acetic acid must be added as to produce neutralization; and as the liquid is sometimes used as an external application in cases where the acrimony of the alkali would be hurtful, it is better that there should be even a slight excess of acid. From the variable quantity of acid in the vinegar, the preparation cannot be of uniform strength, and this cannot be obviated by crystallizing the salt, the heat decomposing it which would be necessary to evaporate the water. Were it of any importance, a uniformity of strength might be obtained by ordering the quantity prepared from a given weight of carbonate of ammonia to be reduced by slow evaporation to a certain measure; but this is not necessary, the solution having no great activity, and being given generally in divided doses. It is employed as a diaphoretic in febrile affections, an ounce of it being given, and repeated twice or thrice at intervals of an hour, and its operation promoted by mild diluents. Externally it is sometimes used as a discutient, and as an application in some forms of inflammation.

HYDROSULPHURETUM AMMONIÆ. Hydrosulphuret of Ammonia. Ed.

"Take of Water of Ammonia, Sulphuret of Iron, of each four ounces; Muriatic Acid, eight ounces: Water, two pounds and a half. Pour the acid, previously mixed with the water, upon the sulphuret, and pass the gas that arises over the water of ammonia. The liquor should be kept in bottles well closed."

HYDROSULPHURETUM AMMONIÆ. Hydrosulphuret of Ammonia. Dub.

"Take of Sulphuret of Iron in coarse powder, four ounces; Muriatic Acid, seven ounces by measure; Water, two pints; Water of Caustic Ammonia, four ounces. Put the sulphuret into a matrass, then add gradually the acid previously diluted with the water, and transmit the gas disengaged, by an apparatus properly adapted, through the water of ammonia. Towards the end of the process, apply to the matrass a moderate heat."

The sulphuretted hydrogen is produced in this process by the muriatic acid enabling the iron to decompose part of the water by attracting its oxygen. The hydrogen disengaged combines with a portion of the sulphur of the sulphuret of iron, and forms sulphuretted hydrogen; and this elastic fluid being transmitted through the water of ammonia, unites with it, and forms a liquid of a dark green colour, and a very fœtid odour.

The medicinal applications of hydro-sulphuret of ammonia have been already taken notice of. It depresses the action of the stomach and digestive organs, and has been used from this quality in bulimia and in diabetes, in a dose of from five to ten drops twice a-day.

AQUA SULPHURETI AMMONIÆ. Water of Sulphuret of Ammonia. Dub.

"Take of recently prepared Lime, Muriate of Ammonia in powder, each four ounces; of Sublimed Sulphur, Warm Water, each two ounces. On the lime in an earthen vessel sprinkle the water, and cover the vessel until the lime fall to powder. Mix the powder, when cold, by trituration with the sulphur and muriate of ammonia, avoiding the vapours. Put the mixture into a retort, and distil with a heat suddenly raised, and sufficiently strong. Keep the liquor thus obtained in a phial closely stopt with a glass stopper."

This preparation is similar to one long known to chemists by the name of Fuming Liquor of Boyle, and which Berthollet considered as a hydrosulphuret of ammonia much concentrated, with an excess of ammonia to which he ascribed its fuming property. As muriatic acid, when added to it, causes not only a disengagement of sulphuretted hydrogen, but also a precipitation of sulphur, it is probably a sulphuretted hydrosulphuret. It has not been applied to any medicinal use.

CHAP. XXII.

TERRAE.—EARTHS, AND EARTHY SALTS.

As chemical agents, the Earths have a distinct character. They are dull and insipid, uninflammable, infusible, and sparingly soluble in water. Four only of them are used in medicine, Lime, Magnesia, Barytes, and Alumina; the three first of which are, from their resemblance to the alkalies, termed Alkaline Earths; the last, with others not employed in medicine, are again called Proper Earths. From the discoveries of Sir H. Davy, they appear to have metallic bases, forming a regular series from the fixed alkalies to the metallic oxides,—to the latter of which their bases bear greater analogy than those of the fixed alkalies.

Combined with acids, the earths form neutral salts, resembling strongly those salts formed by the combination of an acid with an alkali. Their effects upon the animal economy are also nearly similar.

Alumen Exsiccatum. Dried Alum. Ed.

"Let Alum be liquefied in an earthen or iron vessel, and exposed to heat until it cease to boil; then reduce it to a powder."

Alumen Exsiccatum. Dried Alum. Lond.

"Melt Alum in an earthen vessel on the fire; then let the heat be increased, until ebullition cease."

Alumen Ustum. Burnt Alum. Dub.

"Take of Alum, any quantity. Expose it to a strong heat in an earthen vessel, until it cease to boil."

In this process, the alum loses its water of crystallization; it is deprived of its hardness, and resolved into a spongy mass, easily reducible to a fine powder; from this, and from being rendered more active, it is better adapted to the purposes of an escharotic, to which it is applied.

Liquor Aluminis Compositus. Compound Solution of Alum. Lond.

"Take of Alum, Sulphate of Zinc, each half an ounce; Boiling Water,

two pints. Dissolve the alum and the sulphate of zinc in water; then strain through paper."

This forms an astringent solution, which has been employed to check hæmorrhage or profuse mucous discharges; and when largely diluted, has been used as a collyrium.

Murias Barytæ. Muriate of Barytes. Ed.

"Take of Carbonate of Barytes, Muriatic Acid, each one part; Water, three parts. To the water and acid mixed together, add the carbonate, bruised into small pieces. The effervescence being finished, digest for an hour, then strain, and after due evaporation put the liquor aside that crystals may form. Repeat the evaporation as long as there is any formation of crystals.

"If the carbonate of barytes cannot be procured, the muriate may be prepared from the sulphate, in the following manner:—

"Take of Sulphate of Barytes, two pounds; Wood Charcoal in powder, four ounces; Muriatic Acid, as much as may be necessary. Calcine the sulphate, that it may be the more easily reduced to a fine powder, with which is to be mixed the powder of charcoal. Put this into a crucible, and having adapted a cover, urge it with a strong fire for six hours. The matter being well triturated, put it into six pounds of Boiling Water, in a closed glass or earthen vessel, and mix them by agitation, preventing as much as possible the access of the air.

Let the vessel stand in a vapour-bath until the part not dissolved has subsided; then pour off the liquor. Pour on the residuum four pounds of boiling water, which, after agitation and subsidence, add to the former liquor. While it is yet hot, or, if it has cooled, having again heated it, drop into it the Muriatic Acid as long as effervescence is excited. Then strain it, and evaporate, that it may crystallize."

The first of these processes is the one most easy of execution, the muriatic acid combining readily with the barytes, and disengaging the carbonic acid; the muriate of barytes remains dissolved, and by evaporation is obtained crystallized. But the native carbonate of barytes not being an abundant mineral, is not always to be procured; the second process, therefore, is inserted, in which the sulphate, which is a more common fossil, is substituted. In this process, the carbonaceous matter with which the sulphate is heated attracts the oxygen of the sulphuric acid; the sulphur remains united with the barytes. This sulphuret of barytes is dissolved by the water, and freed from any undecomposed sulphate; but in dissolving, it is at the same time, like other sulphurets with an alkaline or earthy base, partially changed; a portion of its sulphur attracts oxygen from the water, reproducing sulphuric acid, with which a little barytes unites and is precipitated; the hydrogen of the decomposed water unites with another portion of sulphur, forming sulphuretted hydrogen, which enters into combination with the remaining sulphuret of barytes, and prevents its farther decomposition, forming what may be named a sulphuretted hydrosulphuret. When the muriatic acid is dropt in, it combines with the barytes, disengages the sulphuretted hydrogen, and precipitates the sulphur. The solution of muriate of barytes, on evaporation, affords the salt crystallized. This process, though a little complicated, is perhaps preferable to any other, as it must afford the barytic salt free from metallic impregnation; for, if any metallic matter be mixed with the sulphate, being reduced by the charcoal, it will not be dissolved in any subsequent part of the process.

Muriate of barytes crystallizes in quadrangular tables: its crystals are soluble in five parts of cold and three of hot water: they are also soluble in alcohol. They consist of 64 of barytes, 21 of acid, and 15 of water. The taste of the salt is harsh and styptic: it proves poisonous to animals, and has been employed medicinally, as has been already stated, principally as a remedy in scrofula.

SOLUTIO MURIATIS BARYTÆ. Solution of Muriate of Barytes. Ed.

"Take of Muriate of Barytes, one part; Distilled Water, three parts. Dissolve."

This saturated solution is designed to afford a preparation of uniform strength,—a circumstance of importance, as from the activity of the medicine, its dose requires to be regulated with care. Five drops are given twice a-day, and gradually increased to twenty or more.

CARBONAS CALCIS PRÆPARATUS. Prepared Carbonate of Lime. Ed.

"Carbonate of Lime, after being rubbed to powder in an iron mortar, and levigated with a little water on a porphyry stone, is to be put into a large vessel. Water is to be poured upon it, and after the vessel has been frequently agitated, it is to be poured off, loaded with the fine powder. On the water remaining at rest, a subtile powder subsides, which is to be dried. The coarse powder which the water could not suspend is to be again levigated, and treated in the same manner."

CRETA PRÆPARATA. Prepared Chalk. Lond.

"Take of Chalk, a pound. Add a little water to the chalk, and rub so as to form a fine powder. Put this into a large vessel filled with water; then shake it, and after a short time pour off the water while still turbid into another vessel, and put it aside, that the powder may subside.—Lastly, having poured off the water, dry the powder."

"Prepared Shells (TESTÆ PRÆPARATÆ) are prepared in the same manner, being previously freed from impurities by washing with boiling water."

CRETA PRÆPARATA. Prepared Chalk. Dub.

"Rub Chalk to powder in an earthen mortar, adding a little water. Mix it with a sufficiently large quantity of water by agitation; after a short time, when the coarser particles have subsided, pour off the liquor. This may be done frequently repeating the trituration. Lastly, collect the very fine powder, which after some time subsides from the liquor poured off, and dry it on a bibulous stone or paper."

"Prepared Oyster Shells (OSTREARUM TESTÆ PRÆPARATÆ) and Prepared Egg Shells (OVORUM TESTÆ PRÆPARATÆ) are prepared in the same manner."

Chalk is a native carbonate of lime, seldom perfectly pure, but containing portions of argillaceous and siliceous earths. The crabs stones are concretions found in the stomach of the river craw-fish (Cancer Astacus). They are collected when the animal is in a putrid state, are washed and dried. They have the advantage of being free from gritty particles, and form therefore a smoother powder.—They consist of carbonate and phosphate of lime, with a portion of gelatin; the proportion of carbonate being about seventy, of phosphate ten or twelve. Shells are of a similar composition; but for all these, there is generally substituted in the shops chalk prepared with care, and having a little gelatin diffused through it. They are used as antacids.

CRETA PRÆCIPITATA. Precipitated Chalk. Dub.

"Take of Solution of Muriate of Lime, any quantity. Add to it, of Carbonate of Soda, dissolved in four times its weight of warm distilled water, as much as may be sufficient to precipitate the chalk. Render the precipitate pure, by allowing it to subside three times, and washing it each time with a sufficient quantity of water. Then collect it, and dry it on a chalk stone or bibulous paper."

In this process, the muriate of lime is decomposed by double affinity, the muriatic acid being attracted by the soda, and the carbonic acid combining with the lime. It affords a pure carbonate of lime, but is scarcely of sufficient importance to be received as an officinal preparation.

Potio Carbonatis Calcis. Potion of Carbonate of Lime. Ed.

"Take of Prepared Carbonate of Lime, an ounce; Refined Sugar, half an ounce; Mucilage of Gum Arabic, two ounces. Rub them together, and then add gradually, Water, two pounds and a half; Spirit of Cinnamon, two ounces."

Mistura Cretæ. Chalk Mixture. Lond.

"Take of Prepared Chalk, half an ounce; Refined Sugar, three drachms; Gum Arabic in powder, half an ounce; Water, a pint. Mix them."

Mistura Cretæ. Chalk Mixture. Dub.

"Take of Prepared Chalk, half an ounce; Refined Sugar, three drachms; Gum Arabic in powder, an ounce; Water, a pint. Mix by rubbing them together."

The chalk is in these mixtures suspended by the mucilage; they afford a form in which it is given as an antacid, but it may be doubted whether the mucilage and sugar will not rather be injurious in that state of the stomach which generates acidity. The dose is one or two ounces.

Calx. Lime. Lond.

"Take of Limestone, a pound. Bruise it into small pieces, and calcine these in a crucible with a very strong fire for an hour, or until the carbonic acid is entirely expelled, so that acetic acid, when added, shall not disengage any bubbles of air. In the same manner, lime may be prepared from shells, after these have been washed in hot water, and freed from their impurities."

There is little advantage in the introduction of this process; lime prepared on the large scale, for the numerous uses to which it is applied, being sufficiently pure for any medicinal purpose, especially as, when it is internally administered, it must be given in solution; and in the state in which it is usually met with, it impregnates water just as strongly as lime in its purest state.

Solutio Calcis, *sive Aqua Calcis*. Lime Water. Ed.

"Take of Lime recently prepared, half a pound. Put it into an earthen vessel, and sprinkle upon it four ounces of water, keeping the vessel closed while the lime becomes hot, and falls into powder; then pour on it twelve pounds of water, and mix them in agitation. After the lime has subsided, repeat the agitation; and do so about ten times, keeping the vessel always shut, that the free access of the air may be prevented. Let the water be strained through paper, interposing between the filter and the funnel glass rods, that the water may pass through as quickly as possible. Let it be kept in small bottles well stopt."

Liquor Calcis. Liquor of Lime. Lond.

"Take of Lime, half a pound; of Distilled Boiling Water, twelve pints. Pour the water upon the lime, and shake them together, then immediately cover the vessel, and put it aside for three hours; afterwards keep the liquor with the remaining lime, in glass vessels closed, and when it is to be used pour off the clear liquor."

Aqua Calcis. Lime Water. Dub.

"Take of recently calcined Lime, a pound; Boiling Water, a pint. Put the lime into an earthen vessel, and sprinkle the water upon it, closing the vessel while the lime becomes hot and falls into powder, then pour upon it three gallons of cold water. The vessel being again closed, agitate the mixture frequently during twenty-four hours; lastly, strain the liquor through paper placed in a covered funnel, and keep it in vessels well stopt."

Lime is sparingly soluble in water; not more than $\frac{1}{758}$th being dissolved at 60°. Yet notwithstanding this small quantity, the water has a strong styptic taste, and changes the vegetable colours to a green. The caution to exclude the air in this process, arises from the supposition that the lime would combine rapidly with the carbonic acid of the atmosphere. After the solution is strained, it is at least necessary that it should be kept in vessels well stopt; and the direction of the London College is preferable, to keep it in contact with the lime, pouring it off when required for use. Lime water is the form under which lime is used internally. It is employed as a tonic, astringent, and antacid in dyspepsia, chronic diarrhœa, and leucorrhœa. Its dose is from one to two pounds daily.

Aqua Calcis Composita. Compound Lime Water. Dub.

"Take of Guaiac Wood in shavings, half a pound; Liquorice Root cut and bruised, an ounce; Bark of Sassafras bruised, half an ounce; Coriander Seeds, three drachms; Lime Water, six pints. Macerate them without heat for two days, and strain."

The lime water can derive little additional power from these ingredients, and they, on the other hand, must have their powers very imperfectly extracted. The preparation is one, therefore, which can have little activity.

Solutio Muriatis Calcis. Solution of Muriate of Lime. Ed.

"Take of Hard Carbonate of Lime (namely White Marble) in small pieces, nine ounces; Muriatic Acid, sixteen ounces; Water, eight ounces. Mix the acid with the water, and add gradually the pieces of carbonate of lime. The effervescence being finished, digest for an hour. Pour off the liquor, and reduce it by evaporation to dryness. Dissolve the residuum in its weight and a half of water, and strain through paper."

Aqua Muriatis Calcis. Water of Muriate of Lime. Dub.

"Take of Chalk in coarse powder, an ounce; Diluted Muriatic Acid, two ounces. To the acid add gradually the chalk, and the effervescence being finished, strain."

Calcis Murias. Muriate of Lime. Lond.

"Take of the Salt, which remains in the distillation of Subcarbonate of Ammonia, two pounds; Water, a pint. Mix and strain through paper; evaporate the liquor until the dry salt is obtained. Let this be kept in a vessel accurately stopt."

Liquor Calcis Muriatis. Liquor of Muriate of Lime. Lond.

"Take of Muriate of Lime, two ounces; Distilled Water, three fluid-

ounces. Dissolve the muriate of lime in the water, then strain through paper."

In the process of the Edinburgh and Dublin Pharmacopœias, the muriatic acid combines with the lime, and disengages the carbonic acid. To remove any superfluous acid, and obtain a solution of uniform strength, the solid salt is in the first process obtained by evaporation, and is then dissolved in a fixed proportion of water. In the process of the London College, the ammoniacal subcarbonate being prepared by decomposing muriate of ammonia by lime, the residual salt is muriate of lime, which by solution and filtration is obtained pure; and by dissolving it in the proportion of water that is ordered, a solution is obtained of about the same strength as that in the Edinburgh Pharmacopœia. The solution of muriate of lime has been recommended as a tonic, similar, and not inferior to the muriate of barytes. The dose is from fifteen to twenty grains of the dried salt, or thirty drops of the solution.

Carbonas Magnesiæ. Carbonate of Magnesia. Ed.

"Take of Sulphate of Magnesia, four parts; Subcarbonate of Potash, three parts; Boiling Water, as much as may be necessary. Let the salts be dissolved separately in twice their weight of warm water, and either strained or otherwise freed from impurities. Then mix them, and immediately add eight times their weight of boiling water. Boil the liquor for a short time, stirring it, then allow it to remain at rest, until the heat be diminished a little, and strain it through linen, on which the carbonate of magnesia will remain. Wash it well with pure water, and dry it afterwards by a gentle heat."

Magnesiæ Carbonas. Carbonate of Magnesia. Lond.

"Take of Sulphate of Magnesia, a pound; Subcarbonate of Potash, nine ounces; of Water, three gallons. Dissolve separately the subcarbonate of potash in three pints of water, and the sulphate of magnesia in five pints of water, and strain; then add the remaining water to the liquor of the sulphate of magnesia, and boil; add the former liquor to it whilst it boils, constantly stirring with a spatula; afterwards strain through linen: lastly, wash the powder, by frequently pouring on it boiling water, and dry it on bibulous paper, by a heat of two hundred degrees."

Magnesia. Magnesia. Dub.

"Take of Sulphate of Magnesia, Subcarbonate of Potash, of each two pounds; Boiling Water, twenty pints. Dissolve the sulphate of magnesia and the subcarbonate of potash, each in ten pounds of water. Mix the clear liquors, boil the mixture a little, and strain it while warm through linen stretched, so as to collect the magnesia. Wash out the sulphate of potash, by frequently pouring on boiling water; lastly, dry the magnesia."

In this process there is a mutual decomposition of the salts, the sulphuric acid of the sulphate of magnesia combining with the potash of the carbonate of potash, and the carbonic acid uniting with the magnesia. In the proportion of equal parts of the sulphate and subcarbonate, more of the latter is employed than is necessary; three parts of it, according to Mr. Phillips, decompose four parts of the sulphate of magnesia, and this proportion is now adopted by the London College. The use of adding the boiling water, and boiling the liquor, is, partly to dissolve the sulphate of potash, which is a salt sparingly soluble, and partly to prevent a species of crystallization which the carbonate of magnesia would undergo, rendering it gritty, and thus give it a smoothness which it has not when this

precaution is not observed. Carbonate of magnesia, however, is generally prepared on a large scale from the Bittern, or liquor remaining after the crystallization of muriate of soda from sea-water, which is principally a solution of muriate of magnesia. This is decomposed by carbonate of potash, or sometimes by an ammoniacal carbonate, and there are some niceties of manipulation requisite to give it the whiteness, lightness, and smoothness, which are valued as marks of its goodness. A certain temperature is required for the preparation; the precipitate is allowed to subside gently, and the clear liquor above is drawn off; warm water is first added: when the saline matter is nearly washed out, cold water is poured on. From the due management of these and other circumstances, the product is superior in these qualities to what it would be were it prepared by the above process on a small scale.

This substance, properly prepared, is nearly insipid, light, white, and smooth to the touch; is insoluble in water. It consists of from 45 to 55 of magnesia, from 25 to 48 of carbonic acid, and from 15 to 30 of water. What appears to be the neutral carbonate, obtained in crystals by mixing the saline solutions without applying heat, consists of 25 of magnesia, 50 of acid, and 25 of water. The common preparation is therefore a subcarbonate. It is given as as antacid in a dose from a scruple to a drachm, and usually produces at the same time a laxative effect.

MAGNESIA. Magnesia. Ed.

"Let Carbonate of Magnesia be exposed in a crucible to a red heat, for two hours. Then preserve it in glass phials well stopt."

MAGNESIA. Magnesia. Lond.

"Take of Carbonate of Magnesia, four ounces. Calcine it with a very violent heat for two hours, or until acetic acid dropt upon it does not excite effervescence."

MAGNESIA USTA. Calcined Magnesia. Dub.

"Take of Magnesia, any quantity. Put it into a crucible, and submit it to a strong heat for two hours. Keep the magnesia, when cold, in a glass vessel."

By the heat applied, the carbonic acid of the carbonate, and a considerable portion of its water, are expelled, and the pure magnesia remains. It loses about half its weight. A smaller quantity, therefore, of the pure magnesia, will produce the same effect as a larger of the carbonate. It is preferred to the latter, both from this circumstance, and also where, from the abundant acidity on the stomach, flatulence is occasioned by the disengagement of carbonic acid when the carbonate is used. The subcarbonate employed in its preparation requires to have been very carefully washed; for if even a minute quantity of sulphate of potash adheres to it, which is liable to be the case where the washing has not been thoroughly performed, this seems to be decomposed by the heat applied for the calcination, and a disagreeable sulphureous taste is communicated to the calcined magnesia.

CHAP. XXIII.

METALLICA.—METALLIC PREPARATIONS.

METALS are distinguished by their opacity, brilliancy, and density. They are fusible and volatile at very different degrees of heat; and at various temperatures they combine with oxygen, forming oxides, and, in two or three cases, compounds possessed of acid properties.

The metals used in medicine are Silver, Quicksilver, Copper, Iron, Lead, Tin, Zinc, Bismuth, Antimony, and Arsenic.

Metals, in their pure state, being insoluble in the animal fluids, can scarcely exert any action on the system. Tin, by a mechanical action, is supposed to have an anthelmintic power: some of the others, as iron, copper, and lead, have been supposed to be capable of being acted on by the gastric fluids, so as to produce certain effects; but in general they must be combined with other agents to render their action powerful and certain; and it is their preparations only that are used in medicine.

The general changes which metals are made to undergo, to fit them for medicinal purposes, are, combining them with oxygen, and farther, combining the oxides thus formed with acids. In general it is true, that the metal is more active as a medicine, the more highly it is oxidated, though to this there are exceptions; and its activity is still farther increased by combination with an acid. In general also, where the metal is combined with an acid, it is more certain in its operation than where it is merely oxidated, as its action is independent of the state of the stomach with respect to acidity, which influences the activity of the oxide; and, besides, uniformity of composition is in general more easily attained in the saline compound than in the oxide alone, and from its solubility its state of aggregation has usually less influence on its action.

The metallic preparations form some of our most important remedies. They are those most liable to uncertainty in their operation, from variations in the processes to which they are subjected; they are at the same time those which, from their activity, it is necessary to have least variable in strength. The principles, therefore which regulate their combinations, so far as these are connected with their pharmaceutic preparation, are highly important; and require some illustration, before proceeding to the individual preparations.

The simplest form of combination in which metals are administered, is in the state of oxide. Their oxidation is generally effected by the action of atmospheric air, assisted by heat, sometimes by deflagration with nitre, and sometimes also by acids, the acid being afterwards abstracted by the action of a substance exerting an affinity to it. The first mode always gives the oxide in its purest form; in the second mode, a portion of the alkali of the nitre often combines with the oxide; in the third, a portion of acid often adheres to it.

The principal objection to this form of preparation is the uncertainty to which it is liable in the uniformity of its composition. Every metal is capable of combining with oxygen in different proportions; and its power of acting on the living system in common with all its qualities, is much influenced by the quantity with which it is combined. The degrees of oxi-

dation of which a metal is susceptible, if not indefinite, are numerous, and are liable to be varied by slight diversities of circumstances in the operation by which they are formed. Hence the uncertainty to which such preparations are liable.

The only case in which oxides of uniform composition can be expected to be obtained, are where they are formed under circumstances which establish a perfect uniformity in the process. Thus, if a metal be oxidated by the atmospheric air. at the point at which it melts, as that point is always the same, the oxide will be uniform; and for the same reason, if an oxide is formed at the vaporific point, it will be always of the same composition. But where such a uniformity of external circumstances does not exist, the degree of oxidation may be variable. The state of aggregation too, which is not less dependent on external circumstances, gives rise to a considerable diversity in the action of metallic oxides.

These considerations ought to establish a rule in Pharmacy, which has been too much neglected, that when a process for the preparation of any metallic oxide has been established, and practitioners have become accustomed to its powers and strength, it ought not to be varied or changed, from the idea of some trivial improvement; as an alteration of circumstances, apparently of little importance, may give rise to an important change in the result. And it is nearly demonstrable, that the oxides of a metal formed by different processes, as, for example, by a process conducted in the humid way, or by one with the application of heat, cannot be precisely the same.

The other form of preparation under which metals are administered, is that in which the metallic oxide is combined with an acid. Compounds of this kind are generally more active than those in which the metal is merely oxidated. The acid perhaps imparts additional activity, and the compound being generally more or less soluble, must act more powerfully on the stomach, and be more readily received into the circulating mass, than the oxides which are usually insoluble.

These combinations are generally formed by subjecting the metal to the action of the acid. The acid first yields to it oxygen, either directly, by parting with a portion of what it contains, or by a resulting affinity, enabling it to attract oxygen from the water which may be present, or from the atmospheric air. With the oxide formed in either of these modes, the acid combines.

As a metal can exist in different degrees of oxidation, so it may enter into combination with acids with different proportions of oxygen, and, from this circumstance, important differences in their medicinal powers are established. No preparations can differ more widely than the corrosive muriate of mercury, and the mild muriate or calomel. Yet the primary difference between them is in the degree of oxidation of the metal, the proportion of oxygen being less in the latter than in the former.

In general, when a metal is acted on by a weak acid, or one much diluted, it forms a compound, in which it is less oxidated than when it has been subjected to the action of a more powerful or concentrated acid. Or if heat has been employed to favour the mutual action, the metal passes to a higher state of oxidation than when it has been dissolved in the cold. It even sometimes happens, that after a metal has been oxidated and combined with an acid, it continues to attract oxygen, either from the acid, or from the atmospheric air,—a circumstance which may give rise to alterations in metallic preparations.

It has been stated, that a metal combines with oxygen in numerous, if not in altogether indefinite proportions. It is an important question in Pharmacy, whether this is the case also when they combine with acids; or do they enter into such combinations only in a few determinate degrees of oxidation? According as one or other of these happens, either uniformity of composition, or uncertainty, may be expected to be found in saline metallic preparations; and if the latter be the case, more attention will be required, than might be supposed necessary, in establishing a strict uniformity in the process by which they are formed.

In general it appears, that the acid, by the energy of the affinity it exerts, has a powerful effect in rendering the oxidation determinate, and that these combinations are, therefore, usually established in a few uniform proportions. We have an example of this in the two muriates of mercury. In each of these the metal is in a certain state of oxidation, and whatever process be followed, no intermediate combination appears to be formed. It is also true, however, that the degree of oxidation of the oxide, in combining with the acid, is often less definite. Thus, in crystallizing a solution of sulphate of iron, the crystals which are first formed are of a pale green colour; those formed by a second or third evaporation are deeper, and there remains a liquid incapable of crystallizing. In all these there are different states of oxidation. In like manner, in the solution of mercury in nitric acid, the acid may exist in various degrees of oxidation, according to the manner in which the solution has been performed, and these solutions give rise to different compounds in the decompositions and new combinations, to which they may be subjected.

Another source of uncertainty in the composition of the metallic salts, is, that the metallic oxide can combine with various proportions of acid. We can have the compound with the acid and metallic oxide combined in those proportions which give rise to neutralization, but we can have it also with excess of acid, or excess of base; and each of these will give a preparation different in power, and liable to be very differently affected by other chemical agents.

This is often displayed in preparing metallic compounds by the medium of acids. From the uncertainty to which the oxidation of metals, by the application of heat, is liable, it has frequently been proposed to obtain the product in the humid way, the metal being dissolved in an acid, and this acid being abstracted by a substance exerting an affinity to it, and the metal precipitated in its oxidated state. But these precipitates are not in general pure oxides, as they have been supposed to be; they retain a portion of the acid with which the oxide was combined, and are therefore sub-salts. They are sometimes thrown down merely by water, and they then retain a considerable proportion of acid; and even when subjected, to the more powerful action of an alkali, the whole of the acid is not abstracted, the influence of quantity adding so much to the force of affinity, that a portion of it is retained by the oxide.

The influence of the proportions in which a metallic oxide and acid may combine, is shewn in another case,—that where, by applying heat, the acid has its solvent power so far aided, and is from this cause saturated with the oxide, as to be incapable of retaining the whole in solution when diluted. When water is added to a solution of this kind, a partial decomposition ensues; part of the metallic oxide is precipitated, retaining a portion of acid, forming a sub-salt, while the other portions remain dissolved with an excess of acid. Now, if such a solution is to be decomposed by adding

a neutral salt with the acid of which the metallic oxide is designed to be combined, the water in which the salt is dissolved will act on the metallic solution, and throw down a quantity of this precipitate which will mingle with the precipitate formed by the metallic oxide and the acid of the decomposing salt, and will of course modify its powers. Hence, a metallic solution is liable to afford, when decomposed, very different products, both from the different states of oxidation in which it may hold the metal dissolved, and the different proportions of oxide with which the acid may be combined.

Metallic preparations, it is thus obvious, are liable to uncertainty of composition ; and this suggests the conclusion, that processes with regard to them, once established, ought not to be hastily altered, even in circumstances apparently trivial. It is equally obvious how important it is, that for every active metallic preparation, the same process should be adopted in every country.

The nomenclature of the metallic saline preparations is attended with considerable difficulty, especially in discriminating between the different salts formed from the same acid, united with the same metal, but existing in different states of oxidation. This difference gives rise to different medicinal properties, or at least different degrees of activity, and renders it necessary, therefore, that the names ought to be so far distinct, that the one salt cannot be mistaken for the other. Now, the chemical nomenclature is, with regard to this case, defective, and it is difficult to render it more precise. The system of nomenclature requires that the name of each compound salt should be derived from the acid and the base of which it is composed, the acid affording the radical of the generic name, the base giving the specific appellation. But the names of the species of metallic salts have been derived, not from the metallic oxide which is strictly their base, but from the metal itself.—We thus speak of sulphate of iron, muriate of mercury, and others, though the substances to which these names are applied, are rather sulphate of oxide of iron, muriate of oxide of mercury, &c. Did the metal exist always in one state of oxidation as it is combined with the acid, this would give rise to no inconvenience. But as it is often in different states of oxidation, the nomenclature is deficient, or something more is required to distinguish between the different salts which, from these different states of oxidation, may be formed from the same metal and the same acid.

In general, not more than two salts are formed from diversity of oxidation in the same metal combined with the same acid ; and one method employed to mark their distinction is, to apply the usual generic name to the salt formed from the metal in the low state of oxidation, and to prefix to the same generic name applied to the other salt, the syllable *oxy*, as denoting the higher degree of oxidation. Thus the two muriates of mercury, one containing the metal at a low, the other at a high degree of oxidation, are, according to this method, distinguished, the one by the name of Muriate, the other by that of Oxymuriate of Mercury. But, independent of the objection, that this violates the principles on which the nomenclature is constructed, since the one salt is just as much a muriate as the other ; the syllable *oxy* is appropriated, to denote the compounds of an oxygenated acid ; and Oxymuriate of Mercury, a name now sanctioned by the London College, expresses, not a compound of muriatic acid, but a compound of oxymuriatic acid. And as a medical nomenclature, the merely prefixing the syllable to the same term is far from being sufficient to dis-

tinguish between salts totally different, and which it is dangerous to confound. Another method is, to apply the generic term to the salt formed from the oxide at the maximum of oxidation, and to prefix to the same term applied to the salt at the minimum, the syllable *sub*; naming, for example, one of the salts of mercury now referred to, Muriate of Mercury, the other Submuriate of Mercury. This has been adopted by the Edinburgh College; but it is equally incorrect. The principles of chemical nomenclature require that the epithet *sub* should be appropriated to the names of those salts in which there is a deficiency of acid, the base being the same as that of the corresponding salt, to the name of which this epithet is not prefixed. But in the metallic salts to which this mode has been applied, there is no deficiency of acid, and the base is not the same: the salt to which the epithet *sub* is applied may contain less acid than the other, but this is because the oxide which is its base requires less for its saturation; it is altogether a different species, and by the addition of acid cannot be converted into the other, which it would be, were it, as the name implies, a Sub-salt. This mode, too, is liable to the same objection as the other, the merely prefixing to the name common to both, the epithet *sub*, to distinguish them, not being sufficiently distinctive, where it is of so much importance that they should be distinguished.

Any nomenclature founded on the supposition of specific degrees of oxidation being established, would be equally improper; for, even supposing them not to be indefinite, the propriety of the appellation in any case would depend on the perfect accuracy of the analysis, and the discovery of a different degree of oxidation with regard to any metal would require the change of the nomenclature of its salts, and, what is worse, would cause a name, which had been appropriated to one, to be transferred to another.

The only mode that appears practicable, if names altogether arbitrary are not adopted, is to derive the distinctive appellations from peculiarities of properties. If two salts, formed from the same metal and the same acid, but in different states of oxidation, differ in colour, this affords a ground of discrimination in their names, and it is accordingly sometimes had recourse to. Thus, we speak of the green and the brown sulphate of iron. If the colour be the same in each, the distinction may be drawn from any other property in which they differ. Thus the two muriates of mercury may be distinguished, the one by the appellation of Corrosive Muriate, the other by that of Mild Muriate. This nomenclature, while it violates no principles, has the advantage, that being founded on the properties of the substances, it is permanent; and as applied to medicinal substances, it has the advantage, that it serves in the more important cases to point out the difference to which it is most essential to attend.

Metals are sometimes employed medicinally, combined with sulphur or with sulphuretted hydrogen. When the sulphur is united with the metal itself, the preparation is generally inactive. When the metal is oxidated, and farther combined, either with sulphur or sulphuretted hydrogen, it is more active; but as the degree of oxidation may be various, and as the affinities exerted by sulphur or sulphuretted hydrogen are not sufficiently energetic to render them definite, these preparations are liable to be variable in strength. Hence few of them are retained.

ANTIMONIUM.—ANTIMONY.

Sulphuretum Antimonii Præparatum. Prepared Sulphuret of Antimony. Ed.

"Put Sulphuret of Antimony, rubbed to powder in an iron mortar, and afterwards levigated upon a porphyry stone, in a large vessel: then pour upon it water, which, after shaking the vessel frequently, is to be poured off loaded with fine powder. After the water has settled, the powder will subside, and then may be dried. The coarse powder which the water cannot suspend, is to be again levigated, and treated in the same manner.

Sulphuretum Antimonii Præparatum. Prepared Sulphuret of Antimony. Dub.

"Reduce to powder, and in the manner prescribed for the preparation of chalk, separate the finest particles, which are to be reserved for use."

This preparation is merely levigation; in this levigated state, the sulphuret of antimony has been supposed to act with more certainty than when in coarse powder. It is still, however, very inactive. As a remedy in chronic rheumatism, it has been given in a dose of five or ten grains daily.

Oxidum Antimonii cum Phosphate Calcis, *olim* Pulvis Antimonialis. Oxide of Antimony with Phosphate of Lime, or Antimonial Powder. Ed.

"Take of Sulphuret of Antimony, rubbed to a coarse powder, Hartshorn Shavings, of each equal parts. Mix and throw them into an iron pot not very deep, red hot, and stir them constantly until they are burnt into a matter of a grey colour, which remove from the fire, rub to powder, and put into a coated crucible. Lute to this crucible another inverted, in the bottom of which a small hole is drilled; apply the fire, which is to be gradually raised to a white heat, and kept at this increased heat for two hours. Lastly, triturate the matter, when cold, into a very fine powder."

Pulvis Antimonialis. Antimonial Powder. Lond.

"Take of Sulphuret of Antimony in powder, a pound; Shavings of Horn, two pounds: Mix, and throw them into a broad iron pot at a white heat, stirring constantly, until they become of a grey colour. Removing the matter, rub it to powder, and put it into a coated crucible, with another crucible inverted, in the bottom of which is a small hole, joining them with lute. Then apply heat, and increase it gradually to a white heat for two hours. Rub the residuum, so that it shall form a very fine powder."

Pulvis Antimonialis. Antimonial Powder. Dub.

"Take of Sulphuret of Antimony in coarse powder, Shavings of Hartshorn, of each two pounds. Boil the hartshorn in a quantity of water sufficient to separate the animal gluten, then dry and mix it with the antimony; throw the mixture into an open iron pot heated to redness, stirring constantly, until the vapours of sulphur cease to exhale, and the matter becomes of a grey colour. Rub the matter when cold into powder, and put it into a coated crucible. Adapt to this another inverted, in the bottom of which is a small hole, and secure the joining with lute. Calcine the matter with a heat gradually raised to a white heat, for two hours; when cold, rub it into a very fine powder."

This process has been introduced into the Pharmacopœias, as affording

a preparation similar to the empirical medicine, *James's Powder*, justly celebrated as a remedy in fever. Nothing more was known of this, than that it was an antimonial, until its analysis was undertaken by Dr. Pearson. He found the genuine powder of James to consist of 43 parts of phosphate of lime, and 57 of an oxide of antimony, part of which was vitrified; and by the above process, he was able to prepare a powder similar to it in qualities and chemical composition. The theory of it is sufficiently obvious. During the first stage, the animal matter of the bones is decomposed and burnt out; the sulphur of the sulphuret of antimony is expelled, and the metal is imperfectly oxidated. In the second stage of the process, the metal is more completely oxidated, the oxide is partially vitrified, and is perhaps brought into combination with the phosphate of lime, which is the residuum of the bones. This latter supposition remains, however, uncertain. That portion at least of the oxide which is vitrified, cannot be combined with the phosphate; the other may be in this state of combination, as Dr. Pearson supposed. Chenevix, from his experiments on the powder, supposed them rather to be merely intimately mixed. He found too, that in the preparation obtained by Pearson's process, more of the oxide of antimony is vitrified than in the genuine James's powder, the proportion in the one being 44 in 100 of the oxide, in the other only 28.

With regard to the above formulas, the only variation in that in the Dublin, from that in the Edinburgh Pharmacopœia, is, that the hartshorn is previously boiled to extract from it the gelatin,—a circumstance of little importance, as this gelatin is decomposed by the heat. The London College have changed the strength of the preparation, two parts of shavings of horn being employed to one of sulphuret of antimony. The reasons which have been assigned for this are, that the preparation is brought nearer to the strength of James's powder, for which this is designed as a substitute, and that it is rendered more manageable in its administration. With regard to the first, there is some doubt, as with the enlarged proportion of antimony, a preparation different in the proportions of its constituent parts from those of the James's powder, as analysed by Pearson, must be obtained. And though it were just, it was of more importance to preserve an active preparation, now officinal, of the same strength in all the Pharmacopœias, than to assimilate it to the strength of an empirical remedy. With regard to the other, the powder appears to be just as manageable of the one strength as of the other. The product of the process of the London Pharmacopœias is said to be perfectly white, in which circumstance it resembles James's powder; that prepared with the larger proportion of sulphuret of antimony has always a yellow shade.

Mr. Chenevix proposed a method of obtaining this preparation in the humid way, by dissolving equal weights of submuriate of antimony and pure phosphate of lime in muriatic acid, and then precipitating them by ammonia. This preparation appeared, from some trials, to be milder in its operation than the other; but its chemical constitution cannot be precisely the same, and probably therefore its powers must be different.

The medical history of these preparations has been already delivered. James's powder has been celebrated as a remedy in febrile affections. It acts as a general evacuant, occasioning sweat, purging, and frequently vomiting; and, by this general action, appears sometimes to arrest the progress of fever, if given at its commencement, or to produce a more favourable crisis. Its dose is five or six grains, repeated every six hours, till its effects are obtained. It has been affirmed, that the preparation ob-

tained by the process of the Pharmacopœias is not so certain nor so powerful as the powder of James, eight grains of the former being not more than equal to six of the latter. The difference, if it exist, may be owing to some peculiarity in the process, by which a difference of oxygenation, or of vitrification of the oxide, may be occasioned ; and it does appear that the proportion of oxide vitrified is not the same in the one as in the other. It remains to be determined, how far the preparation from the proportions, as given now by the London College, differs from the others, or is similar to the James's powder.

Sulphuretum Antimonii Præcipitatum. Precipitated Sulphuret of Antimony. Ed.

"Take of Water of Potash, four parts ; Water, three parts ; Prepared Sulphuret of Antimony, two parts ; Diluted Sulphuric Acid, as much as may be necessary. Mix the Sulphuret with the Water of Potash, and Water, then boil in a covered iron pot, on a gentle fire, for three hours, stirring frequently with an iron spatula, and adding water as it may be necessary. Strain the hot liquor through a double linen cloth, and to this strained liquor, add as much diluted sulphuric acid as may be necessary to precipitate the sulphuret, which is to be carefully washed with warm water."

Antimonii Sulphuretum Precipitatum. Precipitated sulphuret of Antimony. Lond.

"Take of Sulphuret of Antimony in powder, two pounds ; Liquor of Potash, four pints ; Distilled Water, three pints ; Mix and boil with a gentle heat for three hours, stirring constantly, and adding occasionally distilled water, so that it may keep up the same measure. Strain the liquor immediately through a double linen cloth ; gradually drop into it, while still warm, diluted sulphuric acid, as much as is sufficient to precipitate the powder ; then remove the sulphate of potash, by washing with warm water : dry the precipitated sulphuret of antimony, and rub it to fine powder."

Sulphur Antimoniatum Fuscum. Brown Antimoniated Sulphur. Dub.

"Take of Subcarbonate of Potash, Prepared Sulphuret of Antimony, each an ounce. Melt them mixed together in a crucible, then reduce the cold matter to powder. Put this into a matrass with four pints of water, and boil for a quarter of an hour ; remove the vessel from the fire and close it ; allow it to remain at rest for a short time, and as soon as the liquor has become clear, opening the vessel, pour it cautiously from the sediment ; the antimoniated sulphur will separate in part, as the liquor cools ; add of diluted sulphuric acid as much as may be sufficient to throw it down entirely, which leaves an excess of acid ; shake the mixture that the matter last thrown down (which will be of a yellowish-red colour) may be mixed with the rest ; then, after due subsidence, pour off the liquor from the sediment, which wash with cold water as long as the decanted liquor appear acid by the test of litmus. Lastly, dry it on bibulous paper."

The only variation of any apparent consequence in these processes is in that of the Dublin Pharmacopœia, in which the sulphuret of antimony and subcarbonate of potash are fused together, and the matter is lixiviated afterwards with water ; the liquor thus obtained, however, appears to be the same with that formed by boiling the water of potash on the sulphuret ; and the successive steps being similar, there is no essential difference in the product.

From the analysis of this preparation by Thenard, it appears to be composed of 68.3 of the orange-coloured oxide of antimony, (which consists of 18 of oxygen, and 82 of antimony), 17.8 of sulphuretted hydrogen, and 11 or twelve of sulphur. The theory of its formation is somewhat intricate. In boiling the sulphuret of antimony with the potash, a sulphuret of potash is formed, and this decomposing part of the water, a sulphuretted hydrosulphuret of potash, that is, a compound of potash, sulphur and sulphuretted hydrogen, is also produced; the antimony appears to be at the same time oxidated, probably by the sulphuretted hydrogen acting as a weak acid, and by a disposing affinity enabling it to attract part of the oxygen of the water. This oxide is retained in solution by the sulphuretted hydrosulphuret of potash. When sulphuric acid is added, it unites with the potash; a little of the sulphuretted hydrogen is disengaged with effervescence, and the antimonial oxide, combined with the remaining sulphuretted hydrogen and with the sulphur, is precipitated. The compound, therefore, is a sulphuretted hydrosulphuret of oxide of antimony, or a compound of oxide of antimony, sulphur and sulphuretted hydrogen, as stated above. The name given to it in the Pharmacopœias does not at all express its real nature. It was formerly, from its colour, named Golden Sulphur of Antimony.

When the liquor obtained by boiling the solution of potash on the sulphuret of antimony is strained, and allowed to cool, it deposites a red-coloured powder, which has been known by the name of *Kermes Mineral*, and has been much used on the Continent. From the analysis of it by Thenard, it appears to be a compound of brown oxide of antimony, and sulphuretted hydrogen, with a small portion of sulphur; the proportions being 73 of oxide of antimony, 20 of sulphuretted hydrogen, and 4 of sulphur; the last, as Thenard supposes, being accidental. Trommsdorff attributes the difference between these two preparations to the one *essentially* containing sulphur combined with the oxide of antimony and sulphuretted hydrogen, the other not. Thenard ascribes it rather to a difference of oxygenation, the oxides in the *kermes* being less highly oxidated than in the other; but as both can be obtained from the same solution, either as we allow it merely to cool, or as we add sulphuric acid, which cannot change the state of oxidation, this is not probable, while the difference in the proportion of sulphur must, from the nature of the process, necessarily exist; for, in the one case, the oxide can be combined only with those proportions of sulphur and sulphuretted hydrogen which it can attract, while in the other, the sulphur precipitated by the addition of the acid must be also added to it. The kermes mineral is probably therefore essentially a compound of oxide of antimony and sulphuretted hydrogen, with a small and variable proportion of sulphur. The one preparation, the Kermes Mineral, may be distinguished, though not perfectly correctly, by the name of Hydrosulphuretum Oxidi Antimonii Rubrum; the other by that of Hydrosulphuretum Oxidi Antimonii Luteum. The quantity of both products, from a given weight of sulphuret of antimony, may be considerably increased by adding a portion of sulphur, and increasing the quantity of alkali, the proportion of sulphur in the native sulphuret not being sufficient to render the whole of the metal soluble, and a quantity of it, therefore, without this addition, remaining undissolved.

These preparations agree nearly in their medicinal qualities, which are similar to those of the other antimonials. They have been used principally as diaphoretics and sudorifics, but are always uncertain in their ope-

ration, and in this country are scarcely used. The dose of the precipitated sulphuret of antimony, as it is named, is five or six grains, that of the Kermes may be the same.

TARTRAS ANTIMONII, *olim Tartarus Emeticus*. Tartrate of Antimony, formerly Tartar Emetic. Ed.

"Take of Sulphuret of Antimony, Nitrate of Potash, of each equal weights; Supertartrate of Potash, as much as may be necessary. The Sulphuret and Nitrate being separately triturated, are to be well mixed, and then thrown into a red hot crucible. When the deflagration has finished, separate the red matter from the white crust, and rub it down to a very fine powder, which is to be washed several times with warm water, and then dried.

"Equal weights of this powder and the supertartrate of potash are to be triturated together, and the mixture boiled for an hour in a glass vessel, with four times its weight of distilled water; then strain it through paper, and set aside the strained solution so as to form crystals."

ANTIMONIUM TARTARIZATUM. Tartarized Antimony. Lond.

"Take of Sulphuret of Antimony in powder, two ounces; Nitrate of Potash, an ounce; Supertartrate of Potash, two ounces; Sulphuric Acid by weight, two ounces; Distilled Water, a pint and a half. Mix the acid with the water in a proper glass vessel, and apply heat by a sand-bath. When it is moderately heated, add gradually the sulphuret and the nitrate mixed together; then strain, and boil until all the water is dissipated. Wash the residuum with distilled water until it is tasteless, and while it is still humid mix it with the supertartrate of potash, and throw it into a pint of distilled water; lastly, boil down the liquor, and put it aside that crystals may form."

TARTARUM ANTIMONIATUM, *sive Emeticum*. Antimoniated or Emetic Tartar. Dub.

"Take of Nitromuriatic Oxide of Antimony, two ounces; Crystals of Tartar in very fine powder, two ounces and a half; Distilled Water, eighteen ounces. Cause the water to boil in a glass vessel, then throw into it gradually the oxide and tartar previously mixed together, and boil for half an hour; then strain the liquor through paper, and let it cool slowly that crystals may form."

The excess of tartaric acid in the supertartrate of potash is capable of combining with a number of metallic oxides, and of forming ternary compounds. With oxide of antimony, when not too highly oxidated, it unites with facility, forming a combination of this kind, which constitutes the present preparation. In all the processes, the tartaric acid of the supertartrate dissolves a portion of the oxide of antimony, and a triple compound of oxide, acid and potash crystallizes; it is not therefore a tartrate of antimony, but a tartrate of antimony and potash, and the name given to it in the Pharmacopœias is chemically incorrect, and is so without any necessity. Tartras Antimonii et Potassæ is its proper appellation. According to the analysis of it by Thenard, it consists of 38 parts of oxide of antimony, 34 of tartaric acid, 16 of potash, and 8 of water; or stating it in another mode, 34 of tartrate of potash, 54 tartrate of antimony, and 8 of water. It is liable, however, to vary in the proportion of its constituent principles, according to the process by which it has been prepared.

These processes have been very various, this being the most important of all the antimonials, and having therefore much engaged the attention of

chemists. The principal object of their researches has been to obtain an oxide, not too expensive in its preparation, which shall combine easily with the tartaric acid. The oxide precipitated by potash from muriate of antimony was recommended by Bergman, and ordered in a former edition of the Edinburgh Pharmacopœia, but was liable to the former objection, being obtained by a process somewhat difficult and expensive, and hence not being employed by the apothecary. The brown oxide prepared by deflagration of sulphuret of antimony with nitre, the *Crocus of Antimony* as it is named, has therefore been substituted. As the Crocus is not ordered as a separate process in the last edition of the Edinburgh Pharmacopœia, it will be proper to state the theory of the first part of the process in this place.

During the deflagration, the nitric acid of the nitrate of potash is decomposed, and its oxygen is attracted, partly by the sulphur and partly by the antimony. The sulphurous acid, which is the principal product of the oxygenation of the sulphur, is in part dissipated, and in a part combined with the potash; and with a little sulphuric acid likewise produced, forms the white crust which is directed to be removed. By the union of another portion of the oxygen with the antimony, a brown or reddish oxide is formed. It appears also that part of the sulphuret of antimony escapes decomposition or oxygenation, and remains combined with the oxide, in the proportion of about two parts to eight; or rather, perhaps, the oxide retains a little sulphur combined with it. The preparation therefore is an imperfect oxide of antimony with sulphur or sulphuret of antimony. It is of a brick red colour: what is to be found in the shops is of a grey colour, and is usually prepared very improperly, with diminished proportion of nitre.

This preparation, however, is liable to several objections. The crocus of antimony of the shops, which in general will be used by the apothecary, is usually prepared by the trading chemist, and the fraud has become common of preparing it without the due proportion of nitre, so that it is not sufficiently oxidated to be easily soluble in the tartaric acid. Even when it is properly prepared, its state of aggregation, as Mr. Phillips has remarked, prevents it from being dissolved so as to saturate the tartaric acid, unless it be reduced to a very fine powder by levigation, which renders the process expensive.

The submuriate of antimony is free from these objections; and the process introduced by the Dublin College is designed to afford it by a method more easy of execution, than the method recommended by Bergman. It is said to succeed sufficiently, and the principal objection to it is the expense incurred in the previous process of the preparation of the oxide, from the large quantity of muriatic acid employed.

The London College had adopted this process, but with some variations, which rendered its success altogether precarious. The circumstance principally affecting the result was increasing the proportion of nitric acid very considerably, one fluidounce being employed instead of one fluiddrachm. The effect of this seemed to be causing too high a degree of oxidation of the metal, so that the oxide was not capable of being dissolved by the acid, and in practice it was found to be so difficult of execution, and so much influenced by circumstances, as often entirely to fail. It has therefore been discarded; that inserted in its place was proposed by Mr. Hume. The antimony of the sulphuret is oxidated, probably principally by the agency of the nitrous acid disengaged from the nitre by the sulphuric acid, and this oxide, after being freed from the saline matter by washing with water,

is combined with the excess of tartaric acid of the supertartrate in the subsequent boiling. The process is said to afford an emetic tartar of good quality.

Some chemists have considered another oxide, the vitrified oxide or grass of antimony, as the one best adapted to the preparation of emetic tartar; as being always in a proper state of preparation, not expensive, and being capable of saturating the tartaric acid of the supertartrate. It was accordingly recommended by Dr. Black. The principal objection to it is, that it contains a portion of siliceous earth, which enters with the oxide of antimony into combination with the tartaric acid, and when the liquor is evaporated, gives to it a gelatinous consistence, and prevents the crystallization. This, however, scarcely forms a just objection; for it is always proper in the crystallization of this salt not to carry the evaporation of its solution too far. The crystallization itself appears to produce a division in the principles of the combination, the crystals which form first containing more oxide of antimony than those produced by a farther evaporation, and there remaining at length an uncrystallizable liquid, in which there appears to be an excess of potash combined with the acid and a portion of oxide. As the silex, therefore, does not impede the first crystallization, and as any further crystallization ought not to be attempted, its presence can scarcely be regarded as injurious, and the vitrified oxide is perhaps the best on the whole that can be employed.

Another source of diversity in the preparation of emetic tartar, to which all the methods are liable, is the extent to which the solution is evaporated, to cause it to crystallize; the farther the evaporation is carried, more of the potash entering into the composition of the crystals, and the crystals obtained by a second crystallization, when this is practised, being from this cause of a different composition from those of the first. Some degree of impurity is produced also from the presence of tartrate of lime in the supertartrate of potash: it crystallizes when the excess of tartaric acid is neutralized by the antimonial oxide, and forms the groups of acicular crystals diverging from a common centre, which often appear in the crystallized mass. One advantage of employing submuriate of antimony in the preparation, it is remarked by Mr. Phillips, is, preventing this intermixture of tartrate of lime, the lime being retained by the muriatic acid.

These observations shew the difficulty of preparing this salt, so as to obtain a uniform product, and how desirable it is that a proper process should be selected, affording a product as nearly as possible of the same stength as that to which practitioners have been accustomed, and which all the colleges should adopt.

Tartrate of antimony and potash crystallizes in small triedral pyramids, which are efflorescent. Its solubility has been variously stated, and appears to vary according to the quantity of antimonial oxide contained in it. On an average, it is soluble in fifteen parts water at 60°. According to Dr. Saunders, one ounce of water at 60° dissolves fifty-two grains of the fully saturated salt; while of that generally met with, it dissolves from thirty-two to thirty-five. This affords a mode of judging of the strength of this preparation. It is very susceptible of decomposition, suffering it not only from alkalis, earths, acids, and a number of neutral salts, but even from vegetable infusions and decoctions, the vegetable matter attracting apparently part of the oxygen of the oxide,—decompositions, the occurrence of which requires to be guarded against in extemporaneous prescription. If kept dissolved in water, it is decomposed, from the spontaneous decomposition of the tartaric acid.

This preparation is superior to the other antimonials, in the certainty of its operation, at least as an emetic, and from its solubility is more manageable with regard to dose. Its medicinal applications have been already noticed. It is given as an emetic in a dose of from one to three grains, dissolved in water, and, in smaller doses, as an expectorant and diaphoretic.

Vinum Tartratis Antimonii. Wine of Tartrate of Antimony. Ed.

"Take of Tartrate of Antimony, twenty-four grains; White Spanish Wine, one pound. Mix, so that the tartrate of antimony may be dissolved."

Antimonial Wine, as it was named, was formerly prepared by macerating white wine on the vitrified oxide of antimony in powder, the tartaric acid of the wine dissolving a portion of the oxide, so that the wine acquired the powers of an antimonial preparation. It was liable to be variable in strength, from the proportion of acid in the wine not being uniform. The present preparation was therefore substituted for it. It may be doubted, however, whether it is properly officinal. The salt, dissolved in wine, can indeed be preserved longer without decomposition than when dissolved in water; but still, on long keeping, part of the antimonial oxide is deposited. It is given as an emetic in the dose of one ounce; as a diaphoretic, in a dose of one or two drachms.

Liquor Antimonii Tartarizati. Solution of Tartarized Antimony. Lond.

"Take of Tartarized Antimony, a scruple; Boiling Distilled Water, four fluidounces; Wine, six fluidounces. Dissolve the tartarized antimony in the boiling distilled water; then add the wine."

A preparation similar to this in a former edition of the London Pharmacopœia contained four grains of tartrate of antimony and potash in an ounce of wine. The proportion is now reduced to one half, and it is thus with advantage rendered of the same strength as the analogous preparation in the Edinburgh Pharmacopœia, and more similar in strength also to the old antimonial wine. The dilution of the wine renders it a little more economical, but it may have the disadvantage of admitting more readily of the decomposition of the metallic salts.

Antimonii Oxydum. Oxide of Antimony. Lond.

"Take of Tartarized Antimony, an ounce; Subcarbonate of Ammonia, two drachms; Distilled water, a sufficient quantity. Dissolve the salts separately in the water; then mix the solutions and boil until the oxide of antimony is thrown down: the liquor being poured from it, wash and dry it."

The ammonia combines with the tartaric acid, and precipitates the oxide of antimony.

The principal object which has rendered it desirable to have an easy process for procuring a pure oxide of antimony is, that it might be employed in the preparation of tartrate of antimony: with this view, therefore, it would be absurd to procure it from the tartrate of antimony itself. There is no medicinal use to which an oxide of this kind has been applied: and for any pharmaceutical purpose it would be too expensive.

Oxydum Antimonii Nitromuriaticum. Nitromuriatic Oxide of Antiny. Dub.

"Take of Prepared Sulphuret of Antimony, two ounces; Muriatic Acid by measure, eleven ounces; Nitrous Acid by measure, one drachm. Add

the sulphuret gradually to the acids, previously mixed in a glass vessel, avoiding the vapours; then digest with a heat gradually raised until the mixture cease to effervesce; lastly, boil for an hour. Strain the liquor when cold, and receive it strained in a gallon of water; the oxide of antimony is precipitated; wash it with a sufficient quantity of water, until the decanted liquor appear by the test of litmus to be free from acid; lastly, dry the oxide on bibulous paper."

It has been an object of considerable importance in Pharmacy, to procure a pure oxide of antimony in a loose state of aggregation, which might be employed in the preparation of some of the other antimonials, particularly the tartrate of antimony and potash. With this view, this process was introduced into the Dublin Pharmacopœia. Muriatic acid acts very feebly on antimony, not being capable of communicating to it oxygen directly, and the affinity of the metal to this principle not being sufficiently strong as to be able, even when aided by the resulting affinity of the acid, to decompose water. By the addition of nitric acid, the oxidation and solution are more easily effected, the nitric acid yielding oxygen to the metal, and the oxide combining with the muriatic acid; the sulphur of the sulphuret appears to suffer little change. The strained liquor, therefore, is a muriate of antimony, and by adding to this a large quantity of water, the greater part of the acid is abstracted, and the oxide, retaining a small portion of acid in combination, is precipitated. The principal objection to this process is its being too expensive, from the large quantity of muriatic acid employed, in proportion to the quantity of antimony. The London College adopted this formula, but altered the proportions, so as altogether to defeat the success of the process, employing a fluidounce of nitric acid, instead of a drachm by measure; this rendered the action so violent, that the operation could scarcely be conducted, the extrication of offensive vapours being so rapid, and the materials, by the violence of the effervescence, being sometimes even thrown from the vessel. Part of the sulphur too of the sulphuret appeared to be acted on, and brought into a state in which it is not easily separated from the oxidated antimony; and the precipitated oxide could not be used in the preparation of emetic tartar, for which it was designed. The process, therefore, has been thrown out from the late edition of the London Pharmacopœia.

The product of the process of the Dublin College is not, strictly speaking, an oxide of antimony. The precipitate thrown down from muriate of antimony by water was long ago shown by Rouelle to be a submuriate; the water, by its affinity to the acid, abstracting the greater portion of it; but the oxide still, in conformity to the law which usually regulates these decompositions, retaining a portion of the acid combined. To remove the acid more effectually, the London College, in following the formula, ordered the precipitation to be effected by subcarbonate of potash. Even in this way, however, it is not entirely abstracted; it would be more effectually so, if the precipitate thrown down by water were submitted to the action of the subcarbonate of potash dissolved in water. But this is scarcely necessary, and there is even reason to believe, that for the purpose to which this oxide is designed to be applied, that of preparing emetic tartar, the presence of a little muriatic acid, instead of being detrimental, is useful.

This preparation is not designed for internal administration, but for the preparation of other antimonials, particularly that of the tartrate of antimony and potash. Its application to this has been already noticed.

ARGENTUM.—SILVER.

Nitras Argenti. Nitrate of Silver. Ed.

"Take of the Purest Silver, extended in plates and cut, one part; Diluted Nitrous acid, two parts; Distilled Water, one part. Dissolve the silver in the acid and water previously mixed in a phial with a gentle heat, and evaporate the solution to dryness. The mass being put into a large crucible, let this be placed on the fire, which must be at first gentle, and gradually increased until the matter flow like oil. Then pour it into iron pipes, heated and rubbed with grease. Lastly, keep it in a glass vessel well stopt."

Argenti Nitras. Nitrate of Silver. Lond.

"Take of Silver, an ounce; Nitric Acid, a fluidounce; Distilled Water, two fluidounces. Mix the nitric acid with the water, and dissolve the silver in it in a sand-bath, and gradually increase the heat, that the nitrate of silver may be dried. Melt in a crucible, with a gentle heat, until the water being expelled, ebullition ceases; then immediately pour it into proper moulds."

Nitras Argenti. Nitrate of Silver. Dub.

"Take of Silver in thin plates and cut, Nitrous Acid, each an ounce; Distilled Water, two ounces. Put the silver into a glass vessel, placed on sand, and pour on it the acid previously diluted with the water. By a heat gradually increased dissolve the metal, and evaporate the liquor to dryness. The residual matter being put into a crucible, melt it with a gentle heat; lastly, pour it into proper moulds, and keep it in a glass vessel well stopt."

The silver in this process is oxidated and dissolved by the nitrous acid. By the subsequent fusion, a considerable part of the acid is expelled, so that the product has been supposed to be rather a subnitrate than a nitrate of silver; but as an excess of acid is used, this may not be the case. The metal ought to be free from all alloy of copper, which gives to the preparation a green colour, and renders it more deliquescent. The product is a powerful escharotic, and has the advantage of being easily applied, and confined, and of acting quickly. It is therefore the one in general use for the common purposes for which escharotics are employed, especially where the effect designed to be obtained is to be merely superficial.

ARSENICUM.—ARSENIC.

Solutio Arsenicalis. Solution of Arsenic. Ed.

"Take of Oxide of Arsenic reduced to a very fine powder, Pure Subcarbonate of Potash, of each sixty-four grains; Distilled Water, fourteen ounces. Boil in a glass vessel on a slow fire, until the whole oxide be dissolved, and when cool, add Compound Spirit of Lavender, half an ounce; Distilled Water, as much as will make the whole liquor amount to sixteen ounces."

Liquor Arsenicalis. Arsenical Solution. Lond.

"Take of Sublimed Oxide of Arsenic, rubbed to a very fine powder, Subcarbonate of Potash from Tartar, of each sixty-four grains; Distilled Water, a pint. Boil them together in a glass vessel until the arsenic is entirely dissolved. To the solution when cold, add Compound Spirit of

Lavender, four fluiddrachms: then add as much Distilled Water as may be necessary to make up the measure of a pint."

The substance named Oxide of Arsenic has by some chemists been considered as an acid, and named Arsenious Acid. It is not, like the greater number of oxides, insipid and insoluble in water, but has a sharp taste, and is soluble in not more than 80 parts of cold, and 15 of boiling water. It reddens the more delicate vegetable colours, particularly the infusion of litmus, and it combines with the alkalis. The alkaline properties, however, do not appear to be neutralized in these combinations; and it even neutralizes, as Berthollet affirms, the acids in combining with them. Hence, on the whole, it is to be regarded as an oxide in a high degree of oxidation. By combination with potash it becomes more soluble in water; and to render the solution of it perfect, and obtain it in a form in which its dose can be easily regulated, is the object of the present process. The formula was introduced by Fowler, as giving a substitute for the arsenical preparation known under the name of Tasteless Ague Drop. Each ounce of the solution contains four grains of the oxide. The dose is four drops three times a-day, as a remedy in intermittent fever, given with the precautions which have been pointed out under its medical history. The spirit of lavender is designed to communicate colour and flavour; but it would have been better to have added some other tincture, the flavour of which is less commonly known, and the taste less grateful, so as to have guarded against the possibility of the solution being incautiously swallowed.

Arsenici Oxydum Sublimatum. Sublimed Oxide of Arsenic. Lond.

"Triturate Oxide of Arsenic into powder; then put it into a crucible, and applying heat, sublime it into another crucible placed over the former."

Oxide of Arsenic is usually obtained by sublimation from the ores of cobalt in which it is contained, and which are roasted with the view of obtaining the oxide of cobalt for the purposes to which it is applied in the arts. The arsenical oxide is collected in the chimney and flues of the furnace; it is impure, but is usually purified by sublimation before it is brought to the shops, and is in the state either of a solid cake or a powder. Oxide of arsenic is a substance so very active, that any foreign matter it can contain in this state can be of no importance, and the present process is altogether superfluous. Its properties and medicinal applications have been already considered.

Arsenias Kali. Arseniate of Potash. Dub.

"Take of White Oxide of Arsenic, Nitrate of Potash, each one ounce. Reduce them separately to powder; then put them mixed together into a glass retort, placed in a sand-bath, and apply heat, raising it gradually until the bottom of the retort is obscurely red. The vapours which arise should, by an apparatus adapted to that purpose, be transmitted through distilled water, that the nitrous acid disengaged by the heat may be condensed. Dissolve the residual matter in four pounds of boiling distilled water, and after due evaporation put it aside, that crystals may form."

Arsenic, by a high degree of oxygenation, acquires unequivocally the properties of an acid. This acid, the Arsenic as it is named, is formed by distilling the nitrous acid from the oxide of arsenic, the nitrous acid yielding to the oxide the requisite proportion of oxygen. The same change is produced by the present process; the nitric acid of the nitre being decomposed, the oxide of arsenic acquiring from it as much oxygen as con-

verts it into arsenic acid, and this acid remaining combined with the potash of the nitre. The residual mass, therefore, when a sufficient degree of heat has been applied to expel or decompose the nitrous acid, is arseniate of potash. This salt is very soluble in water, and crystallizable. By evaporation of its solution it is obtained in large regular crystals, their figure being a tetraedral prism : in this form, and as obtained by this process, the salt has generally a slight excess of acid : when perfectly neutral, it does not crystallize so easily.

Under this form, as well as under that of the preceding preparation, arsenic has been embloyed as a remedy in intermittent fever, and in some cutaneous diseases. The dose is from one-sixteenth to one-eighth of a grain of the crystallized salt. It does not appear to have any advantage, however, over the more simple preparation.

CUPRUM.—COPPER.

Ammoniaretum Cupri. Ammoniuret of Copper. Ed.

"Take of pure Sulphate of Copper, two parts; Subcarbonate of Ammonia, three parts. Rub them thoroughly in a glass mortar, until all effervescence is finished, and they unite uniformly into a violet-coloured mass, which being wrapt in bibulous paper, is to be dried, first on a chalk stone, and afterwards with a gentle heat. It is to be kept in a glass phial well stopt."

Cuprum Ammoniatum. Ammoniated Copper. Lond.

"Take of Sulphate of Copper, half an ounce; of Subcarbonate of Ammonia, six drachms. Rub them together in a glass mortar, until effervescence cease; then dry the ammoniated copper wrapt up in bibulous paper with a gentle heat."

Cuprum Ammoniatum. Ammoniated Copper. Dub.

"Take of Sulphate of Copper, an ounce; Carbonate of Ammonia, an ounce and a half. Beat them together in an earthen mortar until all effervescence cease, and they unite into a mass, which being wrapt up in bibulous paper, is to be dried, and kept in a phial closed with a glass stopper."

The sulphate of copper is decomposed by the carbonate of ammonia. One portion of ammonia combines with the sulphuric acid; another portion of it unites with the oxide of copper, and the violet-coloured mass which is formed is a mixture of the two resulting compounds; or perhaps, what is more probable, the sulphuric acid is in combination with the two bases, forming a ternary compound; the water of the two salts renders the new compound, when it is formed, soft or moist; hence the necessity of drying it: the carbonic acid is disengaged with effervescence. The preparation is of a dark-blue colour, which it retains when dried. It has been chiefly employed as a remedy in epilepsy. It is given in a dose of at first half a grain twice a-day, which is slowly increased to two or three grains, and continued for some time; and for internal administration, it has the advantage, over the salts of copper, of being less liable to excite vomiting.

Liquor Cupri Ammoniati. Solution of Ammoniated Copper. Lond.

"Take of Ammoniuret of Copper, a drachm; Distilled Water, a pint. Dissolve the ammoniuret of copper in the water, and filter the solution through paper."

This is a simpler mode of obtaining a preparation which had a place in the Pharmacopœias, and used to be obtained by an indirect mode given in the following formula, which retains its place in the Dublin Pharmacopœia. The quantity of ammonia, however, is not sufficient to retain the whole oxide of copper dissolved in this large quantity of water; hence a portion of the oxide is precipitated.

Aqua Cupri Ammoniati. Water of Ammoniated Copper. Dub.

"Take of Lime Water, eight ounces; Muriate of Ammonia, two scruples; Prepared Verdigrease, four grains. Mix them together, and digest for twenty-four hours; then pour off the pure liquor."

In this indirect mode of combining oxide of copper with ammonia, the lime decomposes the muriate of ammonia, by combining with the muriatic acid, and the disengaged ammonia combines with the oxide of copper of the verdigrease, forming a dilute solution of ammoniuretted oxide of copper. The preparation is therefore essentially the same with that of the preceding formula. It has been applied, diluted with an equal part of water, as a mild escharotic, to remove specks from the cornea, and sometimes, in its undiluted state, as a stimulant and escharotic to ulcers.

Solutio Sulphatis Cupri Composita. Compound Solution of Sulphate of Copper. Ed.

"Take of Sulphate of Copper, Sulphate of Alumine, of each three ounces; Water, two pounds; Sulphuric Acid, one ounce and a half. Boil the sulphates in water, that they may be dissolved; then to the liquor strained through paper add the acid."

This is a combination of powerful astringents. It has been applied topically to check hæmorrhage, and, largely diluted with water, as a wash in purulent ophthalmia.

FERRUM.—IRON.

Limatura Ferri Purificata. Purified Filings of Iron. Ed.

"A sieve being placed over the filings, let a magnet be applied, that the filings may be drawn through the sieve upwards."

The iron, from the facility with which it is attracted by the magnet, is by this operation obtained pure, the interposition of the sieve in a great measure preventing particles of other metals, or impurities which are mixed with iron-filings got from the workshops, from being entangled in the cluster which adheres to the magnet. The process, though not always attended to in the shops, is a necessary one, where iron is to be medicinally employed in this form, or is to serve for other preparations of this metal.

Subcarbonas Ferri Præparatus. Prepared Subcarbonate of Iron. Ed.

"Purified Filings of Iron are to be frequently moistened with water till they fall into rust, which is to be rubbed to a fine powder."

Ferri Rubigo. Rust of Iron. Dub.

"Take of Iron Wire, any quantity; cut it into small parts, which being exposed to the air, moisten frequently with water until they pass into rust; then rub them in an iron mortar, and by the affusion of water, wash away the finest powder; which dry."

During exposure to air and moisture, iron is oxidated, and this oxide is found to be combined with carbonic acid, absorbed probably from the atmosphere; it is not a carbonate, however, but a subcarbonate: as a chalybeate it is rather more active than the pure metal, and more mild than the other saline combinations of iron. Its dose is from 10 to 20 grains. In a large dose it is liable to occasion uneasiness at the stomach. As an external application it has been employed in cancerous ulceration, the levigated powder being formed into a paste with water: this is spread over the surface of the sore, and is removed every twelve hours: its efficacy in real cancer is very doubtful; but in some forms of ulceration it appears to mitigate the pain, correct the acrimony and fœtor of the discharge, and cause the ulcer to heal. Its operation is promoted by its internal exhibition in the usual dose.

Carbonas Ferri Præcipitatus. Precipitated Carbonate of Iron. Ed.

"Take of Sulphate of Iron, four ounces; Subcarbonate of Soda, five ounces; Water, ten pounds. Dissolve the sulphate of iron in the water; then add the subcarbonate of soda, previously dissolved in a sufficient quantity of water, and mix them well together. Let the carbonate of iron which is precipitated, be washed with warm water, and afterwards dried."

Ferri Subcarbonas. Subcarbonate of Iron. Lond.

"Take of Sulphate of Iron, eight ounces; Subcarbonate of Soda, six ounces; Boiling Water, a gallon; dissolve separately the sulphate of iron and subcarbonate of soda in four pints of the water; mix the liquor together, and put aside, that the powder may subside; then having poured off the liquor above, wash the subcarbonate of iron with warm water, and having wrapt it up in blotting paper, dry it with a gentle heat."

Carbonas Ferri. Carbonate of Iron. Dub.

"Take of Sulphate of Iron, four ounces; Subcarbonate of Soda, five ounces; Water, ten pints. Dissolve the sulphate of iron in the water; then add the soda previously dissolved in a sufficient quantity of water, and mix them together. Wash the carbonate of iron which is precipitated with tepid water, and afterwards dry it."

On mixing the solutions of subcarbonate of soda and sulphate of iron, the soda attracts the sulphuric acid; the carbonic acid in whole or in part combines with the oxide of iron; the sulphate of soda remains in solution; the carbonate of iron is precipitated. It is to be remarked, however, with regard to this, and all the saline combinations of iron, that the metal enters into them in different states of oxidation. There is one oxide, the black, nearly at the *minimum*, containing, according to Lavoisier's estimate, 27 of oxygen in 100, which forms one order of salts; there is another, the red oxide, at the *maximun*, which, according to Proust, contains 0.48, which is the base of another series of saline compounds, and between these are probably intermediate combinations. In the present process, the sulphate of iron which is employed containing the metal in the low state of oxidation, it is this oxide which combines with the carbonic acid; but the compound attracts very speedily oxygen from the atmospheric air, so as to pass to a higher state of oxidation, and it appears at the same time to lose the greater part of its carbonic acid. From these changes the precipitate of carbonate of iron, in washing and drying, changes its colour, from a dark green to a reddish-brown. It differs ultimately, therefore, in little from the rust of iron, except that it may be purer. Both are probably subcarbonates, and the quantity of carbonic acid appears even to be inconsidera-

ble. Subcarbonate of potash is more economical than carbonate of soda in producing the precipitate, and it gives also a larger quantity, as the excess of carbonic acid derived from the latter retains a portion of the product dissolved. For the same reason it is advantageous to mingle the solutions warm. On the other hand, the precipitate by carbonate of soda contains a larger quantity of carbonic acid.

Carbonate of iron, containing the metal at a low state of oxidation, is a mild and not inactive preparation, preferable to the common carbonate or rust, as sitting easier on the stomach. The formula of Griffith, which has been celebrated as a chalybeate, it has been remarked, is a preparation of thi· kind: and as introduced into the London Pharmacopœia, under the name of Mistura Ferri Composita, has been considered. It is as an extemporaneous preparation (in which only it is obtained at the low state of oxidation) that it ought to be used; and in the state in which it is obtained by the present process, it has probably little advantage over the rust of iron.

Oxidum Ferri Nigrum Purificatum. Purified Black Oxide of Iron. Ed.

"Let the Scales of Black Oxide of Iron, which are found at the anvils of the workmen, be placed in contact with the magnet, so that the more pure and thin scales may be attracted by it."

Oxidum Ferri Nigrum. Black Oxide of Iron. Dub.

"Purify the Scales of Oxide of Iron which are found at the anvils of the workmen, by applying a magnet; then reduce them into powder, of which the finer particles are to be separated in the manner directed in the preparation of chalk."

The scales of iron are the fragments struck from the metal when it is heated red hot. Passing through the atmosphere, at this temperature, they are oxidated, but so imperfectly, as to retain their magnetic quality, and therefore admit of this mode of purification by the magnet. They are used in making some of the other chalybeate preparations.

Sulphas Ferri. Sulphate of Iron. Ed.

"Take of Purified Filings of Iron, six ounces; Sulphuric Acid, eight ounces; Water, two pounds and a half. Mix them; and the effervescence being over, digest for a short time in a sand-bath; then strain the liquor through paper, and, after due evaporation, put it aside that crystals may form."

Ferri Sulphas. Sulphate of Iron. Lond.

"Take of Iron, of Sulphuric Acid, each eight ounces; of Water, four pints. Mix the sulphuric acid with the water in a glass vessel, and add to them the iron; then, when the effervescence has ceased, strain the liquor through paper, and evaporate it, so that, when it cools, crystals may form. Having poured off the water, dry these on bibulous paper."

Sulphas Ferri. Sulphate of Iron. Dub.

"Take of Iron-Wire, two ounces; Sulphuric Acid, three ounces and a half; Water, a pint. Mix the acid slowly with the water in a glass vessel; add gradually the iron-wire cut down; digest the mixture so as to dissolve the metal, and strain the liquor through paper; lastly, after due evaporation, put it aside, so that by slow cooling crystals may form."

Iron decomposes water very slowly at a low temperature, but when aided by the action of sulphuric acid the decomposition goes on rapidly. The effect in this case may be ascribed, according to the doctrine of disposing affinity, to the concurrent affinities of the iron to oxygen, of the

acid, or rather the base of the acid to oxygen, and of the acid to iron. These co-operating, prevail over the single affinity of the oxygen to the hydrogen of the water: the water therefore is decomposed; its oxygen, the iron, and the acid unite, and the hydrogen is disengaged in the elastic form. The iron in this combination is at a low state of oxidation, the *minimum* nearly; and the salt which it forms is the Green Sulphate of Iron, so named, to distinguish it from the Red Sulphate, in which the metal is more highly oxidated. This green sulphate is prepared for the various purposes to which it is applied in the arts, on a large scale, by exposing native sulphuret of iron to air and moisture; by the absorption of oxygen, the iron is oxidated, the sulphur is converted into sulphuric acid, and by lixiviation the sulphate of iron is extracted. By the present process it is obtained in a purer state, and fitter therefore for medicinal use. Its crystals are of a light green colour; the residual liquor, by a second evaporation, affords crystals of a darker green, in which the metal appears to exist more highly oxidated. In the shops there is often substituted for this salt the common green vitriol, purified by a second crystallization, a little acid having been added to the solution, to dissolve any excess of oxide.

Sulphate of iron is one of the most active preparations of the metal. Its medium dose is from three to five grains; its medicinal applications have been already noticed. The red sulphate, in which the metal is more highly oxidated, appears to be more active. Its preparation and properties have also been stated under the history of iron.

Sulphas Ferri Exsiccatus. Dried Sulphate of Iron. Ed.

"Take of Sulphate of Iron, any quantity. Heat it in an unglazed earthen vessel, on a gentle fire, until it become white and perfectly dry."

Sulphas Ferri Exsiccatum. Dried Sulphate of Iron. Dub.

"Take of Sulphate of Iron, any quantity. Render it dry and white by exposing it to a strong heat in an unglazed earthen vessel."

This is the sulphate of iron freed from its water of crystallization by the application of heat. It is not medicinally employed, but has a place in the Pharmacopœia from being used in one or two pharmaceutical preparations.

Oxidum Ferri Rubrum. Red Oxide of Iron. Ed.

"Let dried Sulphate of Iron be gradually exposed to a violent heat, until it is converted into a red-coloured matter."

Oxidum Ferri Rubrum. Red Oxide of Iron. Dub.

"Calcine dried Sulphate of Iron, with a very strong fire, until it is converted into a red-coloured matter: wash this, until by the test of litmus the water poured off appears to be free from acid; dry it on bibulous paper."

By an intense heat, sulphate of iron is decomposed: its acid is partly expelled, and in part suffers decomposition, being evolved in the state of sulphurous acid; the metal at the same time becomes more highly oxidated. The red oxide is the residuum. To free it more completely from any adhering acid, the Dublin College order it to be washed with water. It is scarcely medicinally employed, but is used in some pharmaceutical preparations.

Sulphuretum Ferri. Sulphuret of Iron. Ed.

"Take of the Purified Filings of Iron, three parts; Sublimed Sulphur,

one part. Mix them, and expose in a covered crucible to a moderate heat, until they form a mass."

Sulphuretum Ferri. Sulphuret of Iron. Dub.

"Take of Filings of Iron, six ounces; Sublimed Sulphur, two ounces. Mix them, and then expose in a covered crucible to a moderate heat, until they unite."

A formula is given for this substance merely because it is necessary in the formation of Hydro-sulphuret of Ammonia.

Tinctura Muriatis Ferri. Tincture of Muriate of Iron. Ed.

"Take of Purified Black Oxide of Iron, in powder, three ounces; Muriatic Acid, about ten ounces, or as much as may be sufficient to dissolve the powder. Digest with a gentle heat, and, when the powder is dissolved, add as much alcohol as that there shall be of the whole liquor two pounds and a half."

Tinctura Ferri Muriatis. Tincture of Muriate of Iron. Lond.

"Take of Subcarbonate of Iron, half a pound; Muriatic Acid, a pint; Rectified Spirit, three pints. On the subcarbonate of iron, in a glass vessel, pour the muriatic acid, and agitate them occasionally, for the space of three days. Put aside that the impurities, if there are any, may subside, and having poured the liquor off, add to it the spirit."

Tinctura Ferri Muriatis. Tincture of Muriate of Iron. Dub.

"Take of Rust of Iron, half a pound; Muriatic Acid, three pounds; Rectified Spirit of Wine, three pints. To the rust, put into a glass vessel, add the acid, and agitate occasionally during three days. Put aside, that the impurities may subside, and pour off the clear liquor. Reduce this by slow evaporation to a pint, and when cold add the spirit."

Iron, in combining with acids, it has already been remarked, unites with them in different degrees of oxidation; and when at the two extremes, or the *minimum* and *maximum*, forms with the same acid very different salts. This is well displayed in its combination with muriatic acid. When metallic iron is dissolved in the acid, the solution is of a pale green colour, and affords crystals of a similar colour on evaporation. This salt is soluble in water, but is insoluble in alcohol. When the red oxide or the carbonate is dissolved in the acid, the solution is of a yellow colour; it is not crystallizable, but by evaporation is reduced to a deliquescent mass; it is soluble in water, and is abundantly soluble in alcohol. Of course, it must be this salt which forms the basis of the tincture formed by the present process. In the process, as performed according to the formula of the Edinburgh Pharmacopœia, the black oxide which is employed combines with the muriatic acid, and during the solution acquires more oxygen, principally from a partial decomposition of the water, which is promoted by the heat applied. The muriate of iron, in which this more perfect oxide is contained, is soluble in the alcohol, diluted as it is to a certain extent by the water of the acid; yet even with this, the metal is scarcely sufficiently oxidated to form the salt, which is entirely soluble in alcohol. The tincture formed is of a pale green colour; and it even sometimes happens, that if the solution of the iron has been slowly performed, on adding the alcohol to it, a great part of the salt is precipitated in crystalline grains. But in a short time, from exposure to the air, oxygen is absorbed, the colour deepens to a yellow, and the precipitate is dissolved. In the process given in the other Pharmacopœias, the metal

is submitted to the action of the acid in a higher state of oxidation, as it exists in such a state in the rust which is ordered; and the compound is at once formed, which is soluble in alcohol. It may therefore be supposed to be preferable, as there is some risk of the other not being properly prepared, from the tincture being perhaps poured off from the precipitate, instead of being allowed to remain over it until it is dissolved. It appears, however, that the metal may be too highly oxidated to remain in combination with the acid, this tincture always depositing a sediment of oxide when long kept, and this is perhaps more liable to happen when the metal is even at the first in a highly oxidated state. From the proportions in the Dublin formula, the tincture prepared by it must have a considerable excess of acid, and this may prevent any precipitation of the oxide.

This tincture of muriate of iron is a grateful preparation; the alcohol appears to suffer some chemical change from the action of the acid and the metallic oxide, the odour becoming ethereal. It is a preparation also highly active. It is given in the disaeses, in which iron is employed, in a dose of from 10 to 20 drops, largely diluted with water, or, what is more grateful, in wine. If it produce irritation at the stomach, as it is liable to do from its activity, the dose must be diminished.

Tinctura Muriatis Ferri cum Oxydo Rubro. Tincture of Muriate of Red Oxide of Iron. Dub.

"Take of Red Oxide of Iron, an ounce; Muriatic Acid, four ounces; Rectified Spirit of Wine, as much as may be sufficient. Digest the oxide with the acid for twenty-four hours; then boil for half an hour; evaporate the strained liquor until it attain the consistence of syrup, and when cold, add to it rectified spirit of wine, shaking frequently, until the specific gravity of the tincture is to that of distilled water as 1050 to 1000."

This tincture being prepared from the red oxide, may be more active than the other; yet it is probable, that the degree of oxidation in the rust of iron is not much inferior, and that the two tinctures will differ little in power.

Tartras Potassæ et Ferri. Tartrate of Potash and Iron. Ed.

"Take of Purified Filings of Iron, one part; Supertartrate of Potash in powder, two parts; Water, one part. Triturate them together, and then expose in a shallow earthen vessel to the air for fifteen days, stirring daily with a spatula, and adding water occasionally to preserve the mass moist. Then boil it for a short time in four times its weight of water, and pour off the solution from any impurities. It is then to be evaporated to dryness, by the heat of a water-bath, and after reducing it to powder, preserve it in a vessel well closed."

Ferrum Tartarisatum. Tartarised Iron. Lond.

"Take of Iron, one pound; Supertartrate of Potash in powder, two pounds; Distilled Water, one pint. Rub them together, and expose the mixture to the air in an open glass vessel for eight days; then dry it by a sand-bath, and rub it into a very fine powder. Put aside this powder, having again added to it a pint of water, for eight days, then dry it, and rub it into a powder."

Tartarum Ferri. Tartar of Iron. Dub.

"Take of Carbonate of Iron, half an ounce; Crystals of Tartar in fine powder, one ounce; Distilled Water, a pint. Boil them together in a glass vessel, over a slow fire, for an hour, and filtrate the liquor through paper. After it has cooled, and has been filtrated a second time, evaporate it until

a pellicle appear on its surface. The liquor, by cooling, forms a saline mass, which is to be reduced to powder, and kept in close vessels."

In the formula given by the London College the iron is oxidated, by exposure to air and moisture, and its oxide combines with the excess of acid in the supertartrate of potash, a triple compound resulting, composed of potash, oxide of iron, and tartaric acid, though a considerable portion still remains metallic. It forms a powder of a greenish-brown colour, which attracts moisture from the air, but does not deliquesce. By repeating the trituration and exposure to the air in a humid state, the oxidation of the iron is rendered more complete.

The preparations of the Edinburgh and Dublin College afford the proper tartrate of iron and potash, as much of the oxide of iron of the carbonate, as the free tartaric acid of the supertartrate of potash requires for saturation being dissolved, and the ternary compound being obtained by evaporation. Both these, and the less perfect analogous compound obtained by the preceding process of the London Pharmacopœia, have been introduced as mild, and, at the same time, active preparations of the metal. It is soluble in water, and may therefore be given in a state of solution, and considerably diluted, a form in which the saline preparations of iron always prove less irritating. It is stated, too, by Mr. Phillips, that when the acid of the supertartrate is fully saturated with the iron, the taste of the metal is scarcely perceptible: the preparation is therefore less nauseous than other chalybeates in the liquid form. The dose is from five to fifteen grains. The preparation obtained by this formula of the Dublin College has not only been employed in the usual diseases in which iron is prescribed, but has also been recommended as a remedy in dropsy, from the combination of its tonic with a diuretic power; and from its mildness, it is well adapted for administration in scrofula to children in a small dose.

Murias Ammoniæ et Ferri. Muriate of Ammonia and Iron. Ed.

"Take of Red Oxide of Iron, washed and again dried, Muriate of Ammonia, of each equal weights. Mix them well together, and sublime by a strong fire, reduce the sublimed mass to powder, and preserve it in vessels well corked."

Ferrum Ammoniatum. Ammoniated Iron. Lond.

"Take of Subcarbonate of Iron, Muriate of Ammonia, each a pound; mix them thoroughly; then applying a strong heat, sublime quickly; lastly, rub it into powder."

Murias Ammoniæ et Ferri. Muriate of Ammonia and Iron. Dub.

"Take of Red Oxide of Iron, Muriate of Ammonia, each equal weights. Having mixed them well, sublime with a sudden heat sufficiently strong."

Oxide of iron decomposes muriate of ammonia, by attracting the muriatic acid, and, in the present process, this decomposition takes place, ammoniacal gas being exhaled. But from the proportions of the substances employed, part of the muriate of ammonia escapes decomposition, is sublimed by the heat applied, and elevates with it part of the muriate of iron that had been formed; or rather, perhaps, the oxide of iron enters into combination with the acid and part of the ammonia, forming a triple compound. Whichever of these is the result, the process is an unscientific mode of obtaining a muriate of iron; the product, too, is uncertain in strength, more of the muriate of iron being sublimed, according as the heat is applied strongly and quickly. The variation introduced by the London College of employing carbonate of iron appears to be improper, as proba-

bly carbonate of ammonia will be formed and sublimed. Muriate of ammonia and iron is in crystalline grains, of a yellow colour, and somewhat deliquescent. It was principally employed as a remedy in rickets, in a dose to children of two or three grains; but is now little used.

Tinctura Ferri Ammoniati. Ammoniated Tincture of Iron. Lond.
"Take of Ammoniated Iron, four ounces; Proof-spirit, one pint. Digest and strain."

This solution of the preceding compound is an unnecessary preparation, as it differs little from tincture of muriate of iron, and must be less certain in strength.

Acetas Ferri. Acetate of Iron. Dub.
"Take of Carbonate of Iron, half an ounce; Acetic Acid, three ounces. Digest them for three days, and strain the liquor."

In this process, the acetic acid dissolves the iron, and may afford a mild and active chalybeate, probably not differing much in its operation from the tartrate of iron.

Tinctura Acetatis Ferri. Tincture of Acetate of Iron. Dub.
"Take of Acetate of Potash, two ounces; Sulphate of Iron, one ounce; Rectified Spirit, two pints. Rub together the acetate of potash, and the sulphate of iron in an earthen mortar, until they unite into a soft mass. Dry this with a moderate heat; rub the dried matter with the spirit; put the mixture into a phial closely corked, and digest for seven days, agitating it frequently; lastly, pour off the clear liquor from the impurities."

Tinctura Acetatis Ferri cum Alcohole. Tincture of Acetate of Iron with Alcohol. Dub.
"Take of Acetate of Potash, Sulphate of Iron, each one ounce; Alcohol, one pint. Rub the acetate of potash and sulphate of iron in an earthen mortar until they unite into a soft mass; then dry with a moderate heat, and when cold rub it with the alcohol. Put the mixture into a phial well stopt, and digest for twenty-four hours, shaking occasionally; lastly, pour off the clear tincture from the impurities."

These tinctures are the same, with the difference, unimportant, in the proportion of acetate of potash, and the trivial substitution of alcohol for rectified spirit. In the action of the two salts the acetic acid will be combined with the oxide of iron, forming acetate of iron, while the sulphuric acid is united with the potash, so as to form sulphate of potash, at least these binary combinations will be rendered more complete by the action of the alcohol added, sulphate of potash being nearly insoluble in that liquid, while acetate of iron can be dissolved. During the trituration, too, it is probable that the oxide of iron absorbs oxygen from the air; and the salt formed, therefore, will be the one containing the metal at the higher degree of oxidation, and which alcohol more easily dissolves. The tincture may have the advantage over the watery solution of acetate of iron formed by the first process, of being less liable to spontaneous decomposition; but it is altogether superfluous to have two tinctures differing probably in little more than in strength, or indeed to have more than one form of acetate of iron, if there was any necessity for its introduction as an officinal preparation, which is doubtful. The preparations of this metal in the Pharmacopœias are more numerous than what are required in practice.

Liquor Ferri Alkalini. Alkaline Solution of Iron. Lond.

"Take of Iron, two drachms and a half; Nitric Acid, two fluidounces; Distilled Water, six fluidounces; Solution of Subcarbonate of Potash, six ounces. Pour the acid and the water mingled together on the iron; and when the effervescence has ceased, pour off the liquor while still acid. Add this gradually, and at intervals, to the solution of subcarbonate of potash, agitating frequently, until the colour having become of a brownish-red, effervescence is no longer excited. Put them aside for six hours, and then pour off the liquor."

This is a preparation, which has long been known under the name of Martial Alkaline Tincture, and the nature of it is not very well ascertained. The iron is oxidated and dissolved by the nitric acid; and the solution which answers best for its preparation, appears to be that in which the metal is in a low state of oxidation, and in which there is an excess of acid: this is obtained by the solution being effected slowly, and, when in this state, it is of a pale green colour. On adding the solution to the subcarbonate of potash, the alkali saturates a portion of the acid, and the oxide or rather subnitrate of iron is precipitated, but by agitation it is kept suspended, and by the excess of alkali is redissolved, this being accompanied with effervescence from the disengagement of part of the carbonic acid. If the reverse mode of adding the alkaline carbonate to the solution of iron is followed, much of the oxide is precipitated, and is not redissolved even by the excess of alkali. According to this view, the liquid is a ternary compound of oxide of iron, nitric acid, and potash. It has often been remarked, however, by chemists, that more of the precipitate is redissolved, when carbonate of potash is employed, than when pure potash is used; and this would lead to the conclusion, that a portion of the carbonic acid is likewise retained in the combination, and probably contributes, by its action on the alkali and the oxide, to maintain the state of solution. On standing, a portion of nitre, formed from the union of the potash and nitric acid, is deposited, from which the clear liquor is to be poured off; and by this formation of nitre, it is not improbable that the whole, or the greater part of the nitric acid, is withdrawn. It will then be a carbonate of potash and iron. Mr. Phillips has remarked, that the proportion of alkaline carbonate ordered by the College is rather too small to retain the oxide dissolved: it requires about one-twelfth more.

This solution is of a deep reddish-brown colour, transparent, or frequently somewhat turbid, especially from the action of the air. It has a styptic alkaline taste. From the variable state in which it is obtained, from the operation of trivial circumstances in conducting the process, it must be liable to uncertainty of strength; and it has farther been stated by the older chemists, that on being kept, it deposites much of its iron,—a change likely to happen from the metal passing to a higher state of oxidation. Mr. Phillips has also stated, that it is decomposed by water, five parts of water added to one of the solution precipitating oxide of iron in a few minutes. It is therefore so far defective. The advantages belonging to it as a chalybeate have been stated under the general history of iron.

HYDRARGYRUS.—QUICKSILVER.

Hydrargyrus Purificatus. Purified Quicksilver. Ed.

"Take of Quicksilver, six parts; Iron filings, one part. Rub them together, and distil from an iron vessel."

Hydrargyrum Purificatum. Purified Quicksilver. Lond.

"Take of Quicksilver, six pounds; Iron Filings, one pound. Rub them together; then applying heat, distil the quicksilver from an iron retort."

Hydrargyrum Purificatum. Purified Quicksilver. Dub.

"Take of Quicksilver, six pounds. Distil slowly four pounds."

The quicksilver of commerce has been supposed to be frequently adulterated with other metals. To obtain it pure is the design of this process. The addition of the iron-filings renders the distilled quicksilver more bright and mobile, an effect not perfectly explained, but ascribed to the iron retaining combined with it any foreign metal, or any portion of carbon that might have been contained in the quicksilver. But the process is in reality not very necessary; for although quicksilver is easily adulterated, this does not appear to be often practised, what is met with in commerce being in general nearly pure. The distillation, too, is rather difficult of execution, from the weight of the quicksilver and the high temperature that requires to be applied. Wherever there is reason, however, to suspect any impurity, the purification by this method ought to be performed. The Dublin formula is deficient both as omitting the iron, and directing only four pounds out of six to be distilled,—an unnecessary waste, to which it is not to be supposed the apothecary will submit.

Acetas Hydrargyri. Acetate of Quicksilver. Ed.

"Take of Purified Quicksilver, three ounces; Diluted Nitrous Acid, four ounces and a half, or little more than may be requisite to dissolve the quicksilver; Acetate of Potash, three ounces; Boiling Water, eight pounds. Mix the quicksilver with the diluted nitrous acid; and towards the end of the effervescence, digest, if necessary, with a gentle heat, until the quicksilver be entirely dissolved. Then dissolve the acetate of potash in the boiling water, and immediately on the solution, pour the other, and mix them both by agitation. Then put aside, that crystals may be formed. These being placed in a funnel, wash them with cold distilled water; and, lastly, dry them with a very gentle heat.

In preparing the acetate of quicksilver, it is necessary that all the vessels and the funnel which are employed should be of glass."

Acetas Hydrargyri. Acetate of Quicksilver. Dub.

"Take of Purified Quicksilver, by weight, three ounces; Diluted Nitrous Acid by measure, three ounces; Acetate of Potash, three ounces; Boiling Distilled Water, eight pints. Add the acid to the quicksilver, and the effervescence being over, digest on warm sand, that the metal may be dissolved; immediately mix the solution with the boiling water in which the acetate of potash has been previously dissolved; then pass the mixture quickly through double linen; let it cool that crystals may form; these, being washed with distilled cold water, dry on paper with a very gentle heat. In the whole operation glass vessels must be used."

Acetic acid, like the other acids, combines with mercury in different states of oxidation, and forms salts which are different in their properties. When the metal is in a high state of oxidation, a salt is formed which is acrid and soluble: when in a lower state of oxidation, one is obtained more mild and sparingly soluble. The object of the present process is to obtain the latter of these salts: it may be doubted, therefore, if the application of heat directed by both colleges, to promote the solution of the mercury, is proper, as it causes it, in dissolving, to pass to a highly oxi-

dated state. It has another disadvantage; that the acid being saturated with oxide, the solution is decomposed by water, and a subnitrate is precipitated; and accordingly this happens, when a solution, prepared with the aid of heat, is added to a solution of acetate of potash. By employing an excess of acid, this is counteracted to a certain extent; and from this circumstance, the process, as given in the Edinburgh Pharmacopœia, may succeed, while that of the Dublin College is more liable to fail. It is better, however, to avoid these sources of error entirely, by allowing the solution of the mercury in the acid to proceed in the cold. pouring off the solution from any undissolved mercury, and adding to it the solution of acetate of potash warm. On mixing the two solutions, the nitric acid of the nitrate of mercury combines with the potash of the acetate of potash, while the acetic acid unites with the oxide of mercury, and the acetate of mercury at a low degree of oxidation is formed. It remains at first dissolved, but on the liquid cooling a little, it appears in the form of delicate crystals, of a white colour and silvery lustre. Instead of employing boiling water to dissolve the acetate of potash, it is preferable to use only tepid water, as at a high temperature the water is liable to produce a partial decomposition of the acetate, so that it becomes of a yellow colour from a slight excess of oxide. It is necessary, too, not to continue to wash the salt after it is formed with much water, for a similar partial decomposition takes place, and the crystals become yellow. If this should happen, the brilliant whiteness is instantly restored by washing them with a little diluted distilled vinegar, the acetic acid neutralizing the excess of oxide to which the yellow colour is owing. With these precautions, the process, which often fails when they are not attended to, is easily conducted, and the preparation is obtained uniform, and in a proper state.

Acetate of mercury crystallizes in small brilliant scales. It is soluble in hot, and insoluble in cold water. As an antisyphilitic remedy, it is very mild in its operation; but its effects are not considered as sufficiently permanent to allow of its being relied on in effecting a radical cure. Its dose is a grain, night and morning.

MURIAS HYDRARGYRI CORROSIVUS. Corrosive Muriate of Quicksilver. Ed.

"Take of Purified Quicksilver, two pounds; Sulphuric Acid, two pounds and a half; Muriate of Soda, dried, four pounds. Boil the quicksilver with the sulphuric acid in a glass vessel placed in a sand-bath, until the matter become dry. Mix this when cold in a glass vessel with the muriate of soda; then sublime it in a glass cucurbit with a heat gradually raised. Separate the sublimed matter from the scoriæ."

HYDRARGYRI OXYMURIAS. Oxymuriate of Quicksilver. Lond.

"Take of Purified Quicksilver by weight, two pounds; Sulphuric Acid by weight, thirty ounces; Muriate of Soda, dried, four pounds. Boil the quicksilver with the sulphuric acid in a glass vessel, until the sulphate of mercury become dry. Rub this when it has cooled, with the muriate of soda in an earthen mortar, then sublime it from a glass cucurbit with a heat gradually raised."

MURIAS HYDRARGYRI CORROSIVUM. Corrosive Muriate of Quicksilver. Dub.

"Take of Purified Quicksilver, two pounds; Sulphuric Acid, three pounds; Dried Muriate of Soda, two pounds and a half. Dissolve the quicksilver in the acid; and increase the heat gradually until the matter become perfectly dry. Rub this when cold, with the muriate of soda in

an earthen mortar; then sublime it in a proper vessel with a fire gradually raised."

These processes are nearly the same, except that in the formula of the Dublin Pharmacopœia, rather a larger quantity of sulphuric acid is ordered, and a considerably smaller quantity of muriate of soda. The excess of acid, if it is not dissipated in the evaporation, will be useful, as decomposing the muriate of soda more completely; and if the proportion of muriate of soda be sufficiently large to afford the quantity of muriatic acid requisite to the saturation of the oxide of mercury in the sulphate, the reduction of it from the larger proportion ordered in the other Pharmacopœias will be an advantage, as it will render it more easy to apply a due degree of heat to the mixture. On this point comparative experiments would require to be made.

In the first stage of the general process, the sulphuric acid, aided by the high temperature, oxidates the mercury, and combines with the oxide; the salt formed being that which contains the metal in a high state of oxidation. This salt, in its dry state, is mixed with the muriate of soda, and by the application of heat, a double decomposition is effected; the soda attracts the sulphuric acid, and the muriatic acid combines with the oxide of mercury. The muriate of mercury being easily volatilized, is sublimed. The process formerly employed in the preparation of this important mercurial salt, consisted in mixing together subnitrate of mercury, muriate of soda, and dried sulphate of iron, and subliming the muriate of mercury, formed by the re-action of these, by the application of a sufficient heat. The present process, originally proposed by Kunckel, has been substituted as more simple, and more economical, from the expense of the nitric acid in preparing the subnitrate of mercury being avoided. There is reason to doubt, however, whether from a given weight of mercury it affords the same quantity of product; a deficiency arising from the dry sulphate of mercury not containing a sufficient quantity of acid to decompose as much muriate of soda as is requisite to afford the muriatic acid necessary to convert the whole of the oxide of mercury into muriate. The enlarged proportion of sulphuric acid, and diminished proportion of muriate of soda, directed by the Dublin College, are perhaps in this repect useful.

This mercurial, Corrosive Sublimate as it is named, having long been established in medical practice, has been often submitted to chemical analysis. The earlier analyses were necessarily incorrect. The investigation of the composition of this and the other muriate of mercury, the mild sublimate or calomel, was some years ago undertaken by Mr. Chenevix. The corrosive sublimate had sometimes been supposed to be a compound of oxide of mercury with oxymuriatic acid; this supposition he found no reason to admit; the compound consists of mercury in a high state of oxidation united with muriatic acid; the oxide, which is its basis, being composed of 85 of mercury and 15 of oxygen; and 82 of this oxide being united with 18 of muriatic acid. 100 parts, therefore, are composed of 18 of acid, 12.3 of oxygen, and 69.7 of quicksilver. Zaboada, from a more recent analysis, has inferred, that the oxide does not contain more than 10 of oxygen in 100 parts, and that 80 of this oxide are combined with 20 of acid. According to this, the ultimate principles and their proportions will be 20 of acid, 8.5 of oxygen, and 71.5 of quicksilver. Some other chemists have given results nearly the same.

According to the hypothesis which considers oxymuriatic acid as a simple substance, the corrosive sublimate is a compound of it with metallic quicksilver. Hence, in this doctrine, when the muriatic acid acts on the oxide of mercury, they suffer mutual decomposition ; the hydrogen of the muriatic acid combines with the oxygen of the oxide ; while the oxymuriatic principle or chlorine, the other supposed element of the acid, unites with the mercury, and forms the corrosive sublimate.

The impropriety of the term Oxymuriate of Mercury, given to this salt by the London College, has been pointed out in the observations on the nomenclature of the metallic salts. The name Corrosive Muriate of Mercury, now given it by the Dublin and Edinburgh Colleges, is the one which deviates least from the principles on which the system of chemical language is established, and the one which ought to be generally adopted, considered in relation to its medicinal application, as affording the most marked distinction, and approaching nearest to the appellation by which it has been long known.

Corrosive muriate of mercury is obtained by sublimation in the form of a dense crystalline mass ; when sublimed slowly, it condenses in slender prismatic crystals ; and it is obtained in a similar form by crystallization from its watery solution. It is easily soluble in water, requiring 20 parts at 60° for its solution, and 2 parts at 212°. It is still more soluble in alcohol, requiring scarcely 4 parts at 60°. Its taste is acrid and metallic. It changes to a green several vegetable colours ; is decomposed by the alkalis and earths, and by a number of compound salts, and likewise by vegetable infusions.

It is the most powerful of the mercurial preparations. Its dose cannot safely exceed the fourth of a grain, nor can more than one grain be given in twenty-four hours. As an antisyphilitic remedy it has long been established in practice, and, as has been already stated under its history, it possesses some advantages. It acts speedily, and its action is more general on the system, or less determined to particular organs ; these advantages are more than counterbalanced, however, by the occasional violence of its operation, and by the uncertainty which attends it, so that it cannot be relied on in establishing a permanent cure. It is also employed in other diseases, particularly as an alterative in some obstinate cutaneous affections. It is given in the form of solution in water or alcohol, the dose being increased cautiously from the eighth to the fourth of a grain, night and morning, and mucilaginous diluents being taken, to lessen the irritation it is liable to occasion. A solution of this kind has been introduced as an officinal preparation by the London College. As the solution has a very disagreeable taste, it is sometimes made into pills, a little of it being mixed with an equal weight of muriate of ammonia, which renders it more soluble in water, this being dissolved by adding the necessary proportion of water, and the solution being formed into a mass with crumb of bread, and divided into pills, so that each pill contains the eighth of a grain of the corrosive muriate. Externally under the form of solution it is employed as an escharotic in chancre and venereal ulcers of the mouth ; and a very dilute solution of it has been used as an injection, to excite inflammation in obstinate glete.

LIQUOR HYDRARGYRI OXYMURIATIS. Solution of Oxymuriate of Mercury. Lond.

"Take of Oxymuriate of Mercury, eight grains ; Distilled Water, fif-

teen fluidounces; Rectified Spirit, one fluidounce. Dissolve the oxymuriate in the water, and add the spirit."

This formula is designed to afford a form of preparation under which the dose of corrosive muriate of mercury may be easily regulated. An ounce contains half a grain; its dose therefore may be from one to two drachms.

SUBMURIAS HYDRARGYRI MITIS, *sive Calomelas.* Mild Submuriate of Quicksilver. Calomel. Ed.

"Take of Muriate of Quicksilver, four parts; Purified Quicksilver, three parts. Reduce the muriate to powder in a glass mortar, with a little water, so as to avoid the acrid powder: then add the quicksilver, and rub until it disappears: put the dried mass into an oblong phial of which it shall only fill one-third, and sublime over a sand-bath. The sublimed matter is again to be rubbed to powder, and afterwards sublimed; it is then to be reduced to a very fine powder, which is lastly to be washed with boiling distilled water."

HYDRARGYRI SUBMURIAS. Submuriate of Quicksilver. Lond.

"Take of Oxymuriate of Quicksilver, a pound; of Purified Quicksilver, nine ounces. Rub them together, until globules no longer appear, then sublime; afterwards remove the sublimate; rub it to powder, and sublime it twice. Lastly, reduce it to a very fine powder, in the manner prescribed for preparing chalk."

SUBMURIAS HYDRARGYRI SUBLIMATUM, *sive Calomelas.* Sublimed Submuriate of Quicksilver or Calomel. Dub.

"Take of Corrosive Muriate of Mercury, a pound; Purified Quicksilver, nine ounces. Rub them together until the globules disappear, and sublime with a heat sufficiently strong. Having rubbed down the sublimed matter, sublime it again, and reduce it to powder, which wash with distilled water, until the liquor poured off no longer afford any precipitate on a few drops of water of carbonate of potash being added to it; lastly, dry it."

This is, perhaps, the most important preparation of mercury, both from the certainty of its operation, its mildness, combined with sufficient activity, and the numerous indications it is capable of fulfilling. The process, by which it is obtained, is one that fortunately is little liable to be varied by circumstances, but affords an uniform product.

The ultimate result of the process, is to bring a quantity of metallic mercury into combination with the principles of the corrosive muriate. In corrosive muriate, the metal exists in a high state of oxidation, and this oxide is combined with a considerable proportion of muriatic acid. The additional proportion of quicksilver triturated with it, appears to be quickly oxidated, for it soon loses its metallic form, and the whole is converted into a grey powder. By the application of the heat which is necessary to produce sublimation, the combination is rendered complete; the quicksilver which is added, shares the oxygen of the oxide in the corrosive muriate, and the whole oxide, thus formed, combines with the muriatic acid which the corrosive muriate contained. It is a general law, with regard to the combinations of acids with metallic oxides, that when the metal is highly oxidated, more acid is required to produce saturation, that when it is in a lower state of oxidation. Hence, if the degree of oxidation in any saline metallic compound be reduced, less acid will be necessary to the constitution of the new pompound in the neutral state, and this is well displayed in the present combination; for although the quantity of base is increased, re-

latively to the acid, yet as the base is also brought into a lower state of oxidation, the portion of acid appears to be sufficient to produce saturation in the new compound; it gives no indication of being a sub-salt, has no tendency to combine with a larger quantity of acid, nor any power of neutralizing any additional proportion; it is of determinate composition, and is obtained in a crystalline form.

The product, then, of this process, is a muriate of mercury, in which the metal is in a low state of oxidation, and in which this oxide is combined with no large quantity of muriatic acid. Of course, it differs from the corrosive muriate in the lower degree of oxidation of its base, and in that base being combined with less acid.

This is not inferred merely from the nature of the process by which it is formed, though it is sufficiently established by this; but it is likewise confirmed by its analysis. Chenevix inferred, from the same series of experiments by which he investigated the composition of the corrosive muriate, that the oxide which is the base of the mild muriate, is composed of 89.3 of quicksilver, and 10.7 of oxygen; and that 88.5 of this oxide are combined with 11.5 of muriatic acid. Its ultimate principles, therefore, are 11.5 of acid, 9.5 of oxygen, and 79 of quicksilver. It has already been stated, that the latter experiments of Zaboada assign different proportions to the corrosive muriate, and they do the same to the mild muriate, but still they establish the same general difference between the two, that the latter contains less oxygen and less acid than the former. According to Zaboada, the oxide in the mild muriate contains little more than 5 of oxygen in 100 parts, and the salt itself is composed of 89.4 of this oxide, with 10.6 of muriatic acid. Its ultimate principles, therefore, are, 10.6 of acid, 4.4 of oxygen, and 85 of quicksilver. If the analysis of the two preparations is correct, more metallic quicksilver is employed than is necessary to convert the corrosive into the mild muriate.

According to the hypothesis, in which oxymuriatic acid or chlorine is regarded as a simple substance, calomel is a compound of it with metallic quicksilver, containing less chlorine than corrosive sublimate does; the proportion in calomel being to that in corrosive sublimate as 1 to 2, the quantity of mercury being the same in both.

I have pointed out the impropriety of the name given by the Colleges to this preparation, that of Submuriate. The compound is not, as the name implies, a Sub-Salt; nor is its relation to the other salt, named Muriate of Mercury, such, that it can by any addition of acid be converted into it. As a medical nomenclature, it is still more objectionable, that the introduction of it is to be regretted—the merely prefixing the syllable *sub* not being sufficient to guard effectually against the dangerous mistake of confounding it with the other, from which it differs so widely. The name, Mild Muriate of Mercury, given in the present edition of the Edinburgh Pharmacopœia, is under both points of view preferable; though it will always be safer to prescribe it by the arbitrary name of Calomel, by which it has been long known.

The combination, whence the mild muriate of mercury is formed, is scarcely complete at the first sublimation; a portion of the quicksilver rises on the first application of the heat, and adheres to the portion of muriate condensed on the sides of the vessel in minute globules; and a small quantity of unchanged corrosive muriate appears also to be diffused through the mass. To render the combination complete, the sublimed mass is reduced to powder, and is sublimed a second time. The London

College order even a third sublimation, and the practice formerly was, to sublime it six or seven times. This is, however, altogether unnecessary; and it has even been ascertained, that at each sublimation a little corrosive muriate is reproduced. After the second sublimation, any globules of quicksilver that may adhere to the mass are removed: it is reduced to a fine powder by trituration and levigation with water, and is well washed with water, until the water pass off tasteless, and, according to the test given by the Dublin College, until it give no indications of precipitation on adding a few drops of a solution of carbonate of potash. A method has been introduced by Mr. Howard, of conducting the sublimation in an apparatus so constructed, that the vapours are not condensed in the upper part of the vessel, forming a solid mass, but are condensed on the surface of water. The aggregation, whence a certain degree of ductility and hardness arises that renders difficult the levigation of the sublimate, is thus obviated; it is obtained at once in the state of a fine powder, and any corrosive muriate that may rise with it is abstracted.

Mild muriate of mercury obtained by sublimation is in a dense cake, which is evidently an aggregate of short prisms. It is semi-transparent, has a slight yellowish colour, which is liable to be darkened by light, is somewhat ductile and very heavy, its specific gravity being 7.2. It is less volatile than the corrosive muriate; it appears to be altogether insoluble in water; at least Rouelle has stated, that above 1000 parts of water are required for its solution. When pure, it is perfectly insipid.

As a mercurial, this preparation is extensively employed, its operation being mild, and, at the same time, certain and active, and its use is only limited by the tendency it has to occasion purging. As a remedy in syphilis, it is given in the dose of a grain night and morning, its determination to the intestines being prevented, if necessary, by the addition of a little opium. It is the preparation which is usually given in the other diseases in which mercury is employed. It is thus administered in affections of the liver or neighbouring organs, in which advantage appears to be derived, both from its local determination and its purgative operation;—in some forms of inflammatory diseases, particularly chronic rheumatism and croup, in which its beneficial effects appear to arise both from its purgative effect and from its general action on the system;—in dysentery, in which its successful application appears to depend partly on its operation as a cathartic, and partly as a mercurial;—in various forms of febrile affection, particularly the fevers of warm climates, in which this combined operation of it is not less advantageous;—in cutaneous diseases, in which it appears to operate simply as a mercurial alterative;—in various diseases belonging to the class Neuroses, particularly tetanus and hydrophobia, in which it affords the most speedy mode of establishing the general action of mercury on the system;—and in hydrocephalus, where it is probably farther advantageous by increasing absorption. It is in common use as a cathartic, either by itself in a dose from five to ten grains, or in a smaller quantity to promote the operation of other purgatives. Its anthelmintic power is justly celebrated. And it is superior to the other mercurials in assisting the operation of diuretics in dropsy. From its great specific gravity, it ought always to be given in the form of bolus or pill.

Submurias Hydrargyri Præcipitatus. Precipitated Submuriate of Mercury. Ed.

"Take of Diluted Nitrous Acid, Purified Quicksilver, of each eight

ounces; Muriate of Soda, four ounces and a half; Boiling Water, eight pounds. Mix the Quicksilver with the diluted nitrous acid, and, towards the end of the effervescence, digest with a gentle heat, shaking the vessel frequently. It is necessary, however, that more quicksilver should be mixed with the acid than this can dissolve, that the solution may be obtained fully saturated.

Dissolve at the same time the muriate of soda in the boiling water; pour the other solution on this while warm, and mix them quickly together. After the precipitate subsides, pour off the saline liquor, and wash the submuriate of mercury, by frequently adding warm water, pouring it off after each time the precipitate subsides, until it come off tasteless.

Submurias Hydrargyri Præcipitatum. Precipitated Submuriate of Quicksilver. Dub.

"Take of Purified Quicksilver by weight, seven ounces; Diluted Nitrous Acid by measure, five ounces. Pour the acid on the quicksilver in a glass vessel, and when the mixture first ceases to effervesce, digest with a moderate heat for six hours, agitating occasionally; then increase the heat, so that the liquor boil a little; pour it off from the remaining mercury, and mix it quickly with ten pounds of boiling water, in which four ounces of muriate of soda have been previously dissolved; wash the powder which is precipitated with warm distilled water, as long as the liquor poured off affords any precipitate on the addition of a few drops of water of subcarbonate of potash; lastly, dry it."

The design of this process it to obtain mild muriate of mercury, the muriatic acid of the muriate of soda combining with the oxide of mercury, and forming this compound, while the nitric acid of the mercurial solution is saturated by the soda; and the advantages supposed to belong to it are, that it is more easily executed, less expensive, and affords the product in a much finer powder than that obtained by sublimation can be reduced to. It was introduced on the authority of Scheele*, and the directions which are given are those which be pointed out. The theory of metallic solutions was, however, in his time imperfectly understood, and the process to afford the proper product ought to be conducted in a very different manner from that ordered in the Pharmacopœias.

Scheele was evidently misled by the analogy of the increase of solubility of a salt in water by increase of heat. By aiding the action of the acid on the quicksilver by heat, it was supposed that a larger product would be obtained, and that the acid being thoroughly saturated, the product would be more mild. Two circumstances, however, operate in this case, and give rise to other results, which defeat the intention of the process, and have always rendered its success very imperfect."

1*st*, By digesting or boiling the acid on the metal, the decomposition of the acid is facilitated, and the mercury passes to a more highly oxidated state; hence, when the solution is added to the solution of muriate of soda, the degree of oxidation being too great to admit of the whole being converted into mild muriate, a portion of corrosive muriate is formed. It has been observed, indeed, that although in the first stage of the solution much nitric oxide gas is disengaged, indicating a decomposition of the acid to a

* It is very singular that the very some process has a place in the London Pharmacopœia so far back as the year 1650, and the preparation has nearly the same name, Mercurius Dulcis Præcipitatus, and is introduced as a substitute for the Mercurius Dulcis Sublimatus.

considerable extent, yet, after this, an additional portion of quicksilver is dissolved without much effervescence, whence it has been concluded that this portion must receive oxygen from the portion already dissolved, and that the whole therefore still exists in a low state of oxidation. The degree of oxidation may perhaps be reduced in this manner; but the fact is, that the mercury, in the solution thus prepared, is still too highly oxidated to be converted entirely into mild muriate when combined with muriatic acid; a portion of it is always converted into corrosive muriate, and with a solution so prepared, less muriate of mercury is obtained from a given weight of quicksilver, than from a solution prepared entirely in the cold. I have ascertained this by experiment, the quantity of mild muriate obtained from a solution of one ounce of quicksilver in diluted nitric acid in the cold, being a little more than an ounce, while, from the same quantity dissolved with the application of heat, the precipitate did not much exceed half an ounce, while the liquor held dissolved much more corrosive muriate than the other.

2dly, When the solution of the quicksilver in the acid is promoted by heat, the acid is so completely saturated with oxide, that the solution is partially decomposed by mere dilution with water,—a quantity of subnitrate of mercury being precipitated. Hence, when such a solution is mingled with the solution of muriate of soda, this decomposition takes place to a certain extent, from the operation of the water of the solution, and a quantity of this subnitrate is mixed with the mild muriate, and must so far modify its powers.

These sources of error are obviated by using a solution of mercury prepared in the cold, and with a diluted acid; and from such a solution, the product, I have found, is almost entirely mild muriate, with very little corrosive muriate. The method of conducting the process is the following:—Add the quicksilver in small portions at a time to the nitric acid previously diluted with one part and a half of water, (observing the proportions given in the Edinburgh Pharmacopœia), and avoid the application of heat; when the solution is completed, or no more mercury appears to be capable of being dissolved, add a little water to dissolve any part of the nitrate of mercury that may have crystallized; then pour off the clear solution from the undissolved quicksilver, and add it to the solution of muriate of soda. The precipitate, having subsided, is to be carefully washed with water, repeatedly poured on it, to carry off the small quantity of corrosive muriate that is formed. Mild muriate of mercury will thus be obtained. Berthollet has affirmed, however, that even as prepared from a solution of this kind, the precipitate retains in combination a portion of nitric acid, probably owing to the circumstance that such a solution must have an excess of acid, part of which the precipitate, as it is formed, may attract. The process ought probably to be expunged from the Pharmacopœias. It has no advantage; for it is not, as has been supposed, more economical. The fineness of the powder is of little importance, for by levigation the sublimed muriate is obtained sufficiently fine for medicinal use; and the process by sublimation gives a product perfectly uniform, while that by precipitation must always be liable to uncertainty, from being so much influenced by the manner in which it is conducted. If it is ever followed, much attention should be paid to washing the precipitate thoroughly, so that no portion of corrosive muriate may remain mixed with it.

The precipitated mild muriate of mercury is in the state of a smooth

powder, whiter, and of much less specific gravity than the muriate prepared by sublimation,—differences probably depending on its state of aggregation. When pure its medicinal operation must be the same. It has been said from trials that have been made of it, to be more liable to occasion purging. If this difference exists, it is probably owing to the presence either of subnitrate of mercury, or of a minute quantity of corsive muriate.

OXIDUM HYDRARGYRI CINEREUM. Ash-coloured Oxide of Quicksilver. Ed.

"Take of Submuriate of Mercury, half an ounce; Solution of Lime, five pounds. Digest the submuriate in the solution in a vessel lightly closed, for a quarter of an hour; after the precipitate has subsided, pour off the liquor, wash the oxide with distilled water, and then dry it."

HYDRARGYRI OXYDUM CINEREUM. Ash-coloured Oxyd of Quicksilver. Lond.

"Take of Submuriate of Quicksilver, an ounce; of Liquor of Lime, a gallon. Boil the submuriate of mercury in the liquor of Lime, stirring it constantly, until the ash-coloured oxyd of mercury fall down. Wash this with distilled water, and dry it."

PULVIS HYDRARGYRI CINEREUS. Ash-coloured Powder of Quicksilver. Dub.

"Take of Quicksilver, two ounces; Diluted Nitrous Acid, two ounces by measure. Dissolve the quicksilver in the acid with a low heat, and dilute the solution with eight ounces of cold distilled water; drop into it of water of carbonate of ammonia an ounce and a half, or as much as may be sufficient to throw down the precipitate, which wash with warm distilled water, until the liquor poured off yields no precipitate on dropping in a few drops of water of sulphuret of ammonia; lastly, dry it."

The process of the London and Edinburgh Pharmacopœias has been had recourse to, from the supposed difficulty of obtaining the grey oxide, by precipitation from nitrate of mercury by ammonia, uniform. It will afford a preparation sufficiently uniform, and so far similar to the other, that the oxide is in a low state of oxidation, the oxide existing in that state in the mild muriate. The lime by its affinity to the muriatic acid may abstract the greater part of it, but can scarcely be supposed to abstract the whole; and the product is probably, therefore, what is in strictness of nomenclature a submuriate of mercury.

The action of ammonia on metallic salts is not perfectly similar to that of the other alkalis. It has a greater tendency to unite with the oxide and a portion of the acid, so as to form ternary combinations, and from its hydrogen attracting oxygen, it sometimes changes the constitution of the metallic oxide. These actions appear to be modified by the state of oxidation of the metallic salt, and this is well displayed in the effects it produces in the present process on the nitrate of mercury.

If the nitrous mercurial solution is in that state in which the metal is highly oxidated, on adding the ammonia, a precipitate is thrown down perfectly white. This was found by Fourcroy to consist of the oxide of mercury, in combination with a portion of acid and of ammonia, its composition being 68.2 of oxide, 16 of ammonia, and 15.8 of nitric acid. But if the solution contain the metal in a low state of oxidation, the precipitate which is formed is of a dark blue colour, approaching to black. This has been supposed to be merely the oxide of mercury that had been combined with the nitric acid, the ammonia combining with the acid, and precipitat-

ing the oxide. But an obvious objection to this opinion is, that the precipitate is not the same as that thrown down by potash or soda, but is of a more uniform colour, and darker, a proof that ammonia exerts some peculiar action on its production. According to Fourcroy, who investigated with considerable care these and other saline mercurial combinations, the ammonia, in precipitating the oxide from its combination with the acid, partially de-oxidates it, the hydrogen of a portion of the ammonia attracting part of the oxygen of the oxide, and reducing it to a still lower state of oxidation, approaching nearly indeed to the metallic state ; hence, as he affirmed, there is a disengagement of a portion of nitrogen gas in consequence of this decomposition of a part of the ammonia.

In frequently performing this process, it has appeared to me that this peculiarity of action by ammonia is exerted only when the mercurial solution contains the metal in a state of oxidation intermediate between the *minimum* and *maximum*. If care has been taken in preparing the solution, to have it with the metal dissolved at a low degree of oxidation, the precipitate thrown down by potash is as dark in its colour as that by ammonia. But if it be somewhat more highly oxidated, that from ammonia is of a darker colour, and there appears even a film on the surface, with a lustre approaching to metallic. The theory given by Fourcroy, of the operation of the ammonia, is therefore probably just, though I must add, that any effervescence indicating the disengagement of nitrogen gas is extremely slight, and on a small scale scarcely apparent.

Some chemists have supposed, that the dark grey precipitate contains ammonia. When the precipitate, however, is properly prepared, and thoroughly washed, I have not been able to discover any trace of ammonia in it ; when mixed with lime, or with a fixed alkali, no ammonia is exhaled even when heat is applied. If the solution, however, from which the precipitate has been thrown down, has been that in which the metal has been highly oxidated, part of the white triple compound described by Fourcroy will have been formed, and will mix with the dark coloured precipitate, and in this case a portion of ammonia is detected. In decomposing mercurial solutions, accordingly, in this state, the precipitate at different stages of the precipitation is various in its colour, being at first grey, and afterwards lighter, and being more or less light as the solution contains the metal more highly oxidated, evidently from the predominance of the white precipitate. But any ammonia derived from this source, is foreign to what properly constitutes the grey precipitate.

From the circumstances which influence this preparation not having been fully understood, it has been supposed difficult to obtain it uniform ; nor are the directions in the Dublin Pharmacopœia sufficiently precise ; and the direction of applying heat, even though gentle, to favour the solution, is improper. If the process be properly performed, it may be obtained with certainty always the same, and it forms one of the best of the mercurial preparations for internal use. The nitrous acid ought to be diluted with rather more than an equal weight of water, so as to act on the quicksilver slowly, and with scarcely any sensible effervescence ; the quicksilver should be added in small quantities at a time, and in as large a quantity ultimately as the acid can dissolve without the application of heat. When the solution appears to have ceased, the liquor is to be poured off from the undissolved quicksilver, and strained : it is to be diluted cautiously with water, as far as the dilution can be carried without impairing its transparency ; and water of ammonia is to be added as long as any preci-

pitation is produced. The precipitate prepared in this way is of a very deep grey colour, approaching to black; it is to be washed well with water, and dried. In drying, from exposure to the air and light, its colour becomes lighter; still it is of a bluish-grey. In the shops it is usually of a light grey colour, and sometimes almost white, from the solution of mercury from which it has been precipitated containing the metal in too highly an oxidated state. The Dublin College orders carbonate of ammonia to be employed in the precipitation; and it might be supposed from this, that the oxide thrown down will receive carbonic acid, and that the precipitate will be a carbonate or subcarbonate. This, however, is not the case; the carbonic acid is disengaged, and the same precipitate is thrown down by pure ammonia. It has been supposed, that the precipitate is produced with more certainty of a dark colour, when the ammonia is added in the state of carbonate; but this is a mistake, the darkness of the colour depending entirely on the degree of oxidation of the metal.

The Grey Oxide of Mercury has been introduced as a substitute for those preparations in which the metal is oxidated by trituration under exposure to the air, and has been supposed to have the advantage of more uniformity of strength, as the others are liable to be variable from imperfect preparation. When properly prepared, it appears to be the same in chemical composition, and the medicinal operation of it is also extremely similar. It is given in the dose of a grain night and morning, usually under the form of pill, and this answers very well as a substitute for the Mercurial Pill. An ointment formed from it, Unguentum Oxidi Hydrargyri Cinerei, has been introduced into the Edinburgh Pharmacopœia; one part of the grey oxide being mixed with three parts of lard. This is designed as a substitute for the Mercurial Ointment, but it has been said not to be so easily forced through the cuticle by friction. It has also been used in the state of vapour from the application of heat, for fumigating venereal ulcers.

Oxidum Hydrargyri Rubrum per Acidum Nitricum. Red Oxide of Quicksilver by Nitric acid. Ed.

"Take of Purified Quicksilver, three parts; Diluted Nitrous Acid, four parts. Dissolve the Quicksilver, and evaporate the solution with a gentle fire to a white dry mass, which being reduced to powder, is to be put into a glass cucurbit, a thick glass plate being put over its surface. Then a capital being adapted, and the vessel placed in sand, apply to it a fire gradually raised, until it pass into very red small scales."

Hydrargyri Nitrico-Oxidum. Nitric Oxide of Quicksilver. Lond.

"Take of Purified Quicksilver by weight, three pounds; Nitric Acid by weight, a pound and a half; Distilled Water, two pints. Mix them in a glass vessel, and boil until the quicksilver is dissolved, and the water being evaporated, a white matter remains. Rub this into powder, and put into another vessel as shallow as possible; then apply a gentle heat, and gradually increase it, until any red vapour cease to be produced."

Oxydum Hydrargyri Nitricum. Nitric Oxide of Quicksilver. Dub.

"Take of Purified Quicksilver, ten ounces by weight: Diluted Nitrous Acid, ten ounces by measure. Mix them in a glass vessel, and with a heat gradually raised, dissolve the quicksilver; then raise the fire, until the residual matter in the bottom of the vessel pass into red scales."

The quicksilver is in this preparation first oxidated by the nitrous acid, and the oxide then combines with the remaining acid. By the increase of

heat, this nitrate is decomposed, and the greater part of the acid expelled, leaving a mass of a deep red colour. From the name of oxide given to this preparation, it appears to be supposed, that the whole acid of the nitrate is expelled or decomposed, and that the residual matter is quicksilver combined with oxygen alone. This has not been established, however, by any accurate analysis of the preparation, and there are very obvious objections to it. Though a red oxide of mercury can be formed by the action of atmospheric air on the metal at a high temperature, it is quite different in its appearance from the product of the present process; and the latter is possessed of a considerable degree of escharotic power not belonging to the former, communicated probably by a portion of nitric acid combined with it. In cases where a volatile ingredient is expelled from one more fixed by the application of heat, the decomposition is scarcely ever complete, the influence of quantity operating, and causing a portion of the volatile ingredient to be retained, the quantity being greater as there is less difference in the volatility of the two substances. It follows from this, as the most probable conclusion, that although the greater part of the nitric acid may be expelled from the oxide of mercury, a portion of it will be retained, and it is probably impossible to expel the whole of it, without raising the heat to that point at which the oxygen itself will be expelled, and the quicksilver be reduced to the metallic form. I have accordingly found, that it does contain nitric acid. If the preparation be boiled for a short time with five or six times its weight of water, the liquor, when filtered, has the styptic metallic taste, and gives a white precipitate with water of ammonia, or with carbonate of potash,—a plain proof that it holds dissolved nitrate of mercury; and to avoid any fallacy, the preparation submitted to experiment was that found in the shops, the product of the process on the large scale, of a bright red colour, and more perfectly prepared than that formed on the small scale. This must therefore be regarded as a subnitrate, and the proper appellation to be given to it is, Subnitras Hydrargyri Ruber, by which also it will be better distinguished from the proper red oxide. According to Payssc, 100 parts decomposed by heat afford 82 of mercury, and 18 of oxygen; this oxygen probably having an intermixture of nitrogen from the decomposition of the acid. The proper red oxide affords only 007 of oxygen.

It has always been found difficult to conduct this process, so as to obtain the product of that bright red colour and scaly appearance which are regarded as tests of its proper preparation; and some of the steps in the operation, as directed by the Edinburgh College, are designed to attain this more perfectly. Much of the success depends apparently on the scale on which it is formed, the heat acting more steadily, and with more uniformity, on a large, than on a small quantity. When properly prepared, it is in scales of a bright red colour. It is so acrid as to be altogether unfit for internal administration. Externally it is employed as an escharotic, being applied either in a finely levigated powder, or mixed with lard in the form of ointment. This ointment, composed of one part with eight of lard, is officinal in the Edinburgh Pharmacopœia.

Subsulphas Hydrargyri Flavus. Yellow Subsulphate of Quicksilver. Ed.

"Take of Purified Quicksilver, two parts; Sulphuric Acid, three parts. Put them into a glass cucurbit, and boil in a sand-bath to dryness. The white matter remaining at the bottom of the vessel being reduced to

powder, is to be thrown into boiling water. The yellow powder thus produced, is to be frequently washed with warm water."

Oxidum Hydrargyri Sulphuricum. Sulphuric Oxide of Quicksilver. Dub.

"Take of Purified Quicksilver, one pound; Sulphuric Acid, a pound and a half. Dissolve with a heat sufficiently strong in a glass vessel, and increase the heat until the matter become quite dry. On pouring upon it a large quantity of warm water, it becomes yellow and falls into powder, which is to be rubbed with this water carefully in an earthen mortar. After pouring off the fluid above, wash the powder repeatedly with warm distilled water, as long as the decanted fluid gives any precipitate on the addition of a few drops of water of subcarbonate of potash; lastly, dry it."

By boiling sulphuric acid on quicksilver, the acid suffers a partial decomposition, a portion of its oxygen is communicated to the metal, and sulphurous acid gas is disengaged. The oxide of quicksilver combines with the remaining acid, forming supersulphate of mercury. By the continuance of the heat, this is partially decomposed, much of the acid is expelled, and a subsulphate of mercury remains. On this, boiling water is poured; and it acts as water does on many of the metallic salts. Having a stronger affinity to their acid than to their base, it decomposes the salt, abstracting the acid, and precipitating the oxide; but the influence of quantity on chemical affinity still so far operates in this decomposition, that the acid in combining with the water retains a portion of the oxide combined with it, and the oxide precipitated retains a portion of the acid. The entire compound, therefore, is resolved into a supersalt, which is dissolved, and a subsalt, which is thrown down. This happens in the present process; the water poured on the sulphate of mercury abstracts the acid, retaining in combination with it a portion of oxide, and forming therefore a supersulphate of mercury, which remains dissolved, while a subsulphate is precipitated, and forms the yellow powder. The colour of this is more lively when hot water is used in its preparation, probably from the temperature favouring the chemical action of the water. The success of the process, with regard to the quantity of product, depends much on the sulphate of mercury having been deprived of all free acid previous to the affusion of the water; for if it contain much acid, the greater part of the salt is dissolved without being decomposed. The proportion of acid ordered in the Pharmacopœia is unnecessarily large, and rather defeats the object of the process: an equal weight is sufficient, and the heat ought to be applied to the saline mass until it is perfectly dry. The supersulphate which is dissolved in the water may be decomposed by potash, and a subsulphate precipitated.

Yellow subsulphate of mercury must, from the nature of the process by which it is obtained, be liable to variation in the proportions of its constituent principles. According to Fourcroy, it consists of 76 of mercury, 11 of oxygen, and 10 of acid, with 3 of water, while another analysis gives the proportion of acid at 15. As a medicine it is too harsh to be administered internally, being liable to produce violent vomiting. It has sometimes, however, been given as a powerful emetic, in a dose of five grains. It is an errhine, and has been employed as such, mixed with any mild vegetable powder, in some affections of the eyes.

Sulphuretum Hydrargyri Nigrum. Black Sulphuret of Quicksilver. Ed.

"Take of Purified Quicksilver, Sublimed Sulphur, of each equal weights. Rub them together in a glass mortar with a glass pestle, until the globules of quicksilver entirely disappear.

"It may be made likewise with a double proportion of Quicksilver."

SULPHURETUM HYDRARGYRI NIGRUM. Black Sulphuret of Quicksilver. Dub.

"Take of Purified Quicksilver, Sublimed Sulphur, equal weights. Rub them together in an earthen mortar, until the globules disappear."

HYDRARGYRI SULPHURETUM NIGRUM. Black Sulphuret of Quicksilver. Lond.

"Take of Purified Quicksilver, by weight, a pound; Sublimed Sulphur, a pound. Rub them together until the globules no longer appear."

By the trituration a chemical combination appears to be effected between the quicksilver and sulphur, as the former loses completely its metallic form, and no globules can be perceived in the powder by the microscope. It has even been supposed, that the metal is imperfectly oxidated, and combined with sulphuretted hydrogen; but from the researches of Seguin, this does not appear to be the case.—The combination is much facilitated by the application of heat, and it can at once be effected, by adding the quicksilver to the melted sulphur.

This is the least active of the mercurial preparations. As an anthelmintic it is sometimes given in a dose of five or ten grains, and it has been used as an alterative.

SOME additional preparations of mercury have a place in the London and Dublin Pharmacopœias, and are used in practice.

HYDRARGYRUM CUM CRETA. Quicksilver with Chalk. Lond.

"Take of Purified Quicksilver, by weight, three ounces; Prepared Chalk, five ounces. Rub them together until the globules no longer appear."

HYDRARGYRI CUM CRETA. Quicksilver with Chalk. Dub.

"Prepare this in the same manner as Quicksilver with Magnesia, (*described in the next formula*), substituting only Chalk for Magnesia."

Quicksilver, when triturated with any substance which aids the division of its globules, and extends their surface, appears to be susceptible of oxidation from the action of the atmospheric air, and the grey oxide formed by this operation is the basis of the common mercurial pill, as well as of some other preparations. More than one preparation of this kind, however, for internal administration, is superfluous; and the mercurial pill, prepared by trituration of the quicksilver with honey, manna, or mucilage, being that which has been long established in practice, is to be preferred. The present preparation has nothing peculiar to recommend it.

HYDRARGYRUM CUM MAGNESIA. Quicksilver with Magnesia. Dub.

"Take of Quicksilver, Manna, each one ounce; Magnesia, half an ounce. Triturate the quicksilver with the manna in an earthen mortar, adding a few drops of water to give to the mixture the consistence of syrup, and continuing the trituration until the mercurial globules entirely disappear. Then add to the mixture a drachm of the magnesia, triturating it constantly. The whole being well mixed together, add a pint of hot water, and shake the mixture; allow the liquor to rest, and as soon as the sediment subsides, pour it off. Repeat this washing a second and third time, that the manna may be entirely removed; and while the sediment is still humid,

add to it the remaining magnesia. Lastly, dry the powder on bibulous paper."

The object of this process is to obtain the oxidation of the mercury by trituration, and the interposition of the soft viscous matter of the manna with the addition of the water may facilitate this; the subsequent steps of the operation are designed to remove the manna and obtain the grey oxide mixed with the magnesia. The same observation applies, however, to this as the preceding preparation,—that it is superfluous, and that for any useful purpose the mercurial pill will answer equally well. The only advantage at least, of either process, is, that it may afford a mild preparation that can be given under the form of bolus, where a pill cannot be easily swallowed.

HYDRARGYRI OXYDUM RUBRUM. Red Oxide of Quicksilver. Lond.

"Take of Purified Quicksilver, one pound. Put the quicksilver into a glass vessel with a narrow mouth, and broad at the bottom. Apply heat to this open vessel, raised to the six-hundredth degree, until the quicksilver pass into red scales: then rub these into a fine powder."

OXYDUM HYDRARGYRI. Oxide of Quicksilver. Dub.

"Take of Purified Quicksilver, any quantity. Let it be put into an open glass vessel with a narrow mouth, and broad bottom, and expose it to a heat of about 600°, until it is converted into red scales."

At the temperature at which quicksilver boils it combines with oxygen; and when heated to this temperature, under exposure to the air, red scales gradually form on its surface from this combination. There is a difficulty, however, in conducting the process; for if the quicksilver be freely exposed to the air, a considerable quantity of it is lost, from its vapour being dissipated, especially if the heat be raised a little too high; while, on the other hand, if the air is not freely admitted, the oxidation cannot proceed. The method directed in the formula of the Colleges is the most effectual, —employing a glass vessel broad at the bottom, (so as to present the quicksilver under an extensive surface,) and with a long neck, drawn out to a small aperture, so that while the atmospheric air is admitted, the mercurial vapour will not easily escape, the heat being applied by the medium of sand. Still the oxidation goes on very slowly, requiring the application of the heat for several weeks; and from the necessity of keeping up a steady heat without allowing it to become too strong, the conducting of the process requires considerable attention, and the preparation is comparatively high priced.

Red oxide of quicksilver is in scales of a brick red colour. When exposed to the heat of ignition it is decomposed, gives out oxygen, and the quicksilver returns to its metallic form. From the quantity of oxygen obtained by this reduction, Lavoisier inferred that the oxide contains seven parts of oxygen in 100 parts; the proportion is probably rather larger. It is a dangerous mistake which some have made, in supposing that the red scaly substance obtained from the decomposition of nitrate of mercury by heat is essentially the same. The latter is more acrid, and cannot be given internally with safety; and it is to be regretted, that the name of Oxide has been given to it, as it may sometimes lead to its substitution for the present preparation.

The red oxide prepared by heat, Calcined Mercury as it was formerly named, is a very active mercurial. It has also been regarded as certain and permanent in its operation, and has therefore sometimes been em-

ployed in the treatment of the secondary symptoms of syphilis, where the milder mercurials had failed. Its dose is one grain. It is liable to produce irritation in the stomach or intestines, and from this, as well as from its high price, is not very frequently used.

Hydrargyrum Præcipitatum Album. White Precipitate of Quicksilver. Lond.

"Take of Oxymuriate of Quicksilver, half a pound; Muriate of Ammonia, four ounces; Liquor of Subcarbonate of Potash, half a pint; Distilled Water, four pints. First dissolve the muriate of ammonia, then the oxymuriate of mercury in the distilled water, and add to these the liquor of subcarbonate of potash; wash the powder which is precipitated, until it is free from taste; then dry it."

Submurias Hydrargyri Ammoniatum. Ammoniated Submuriate of Quicksilver. Dub.

"To the liquor which has been poured off from the precipitated submuriate of mercury, add as much water of ammonia as is sufficient to precipitate the metallic salt. Wash the precipitate with cold distilled water, and dry it on bibulous paper."

Though these two processes are apparently very different, they afford the same product. When corrosive muriate of mercury is decomposed by ammonia, a white precipitate is thrown down, consisting of the oxide of the muriate, with portions both of acid and of ammonia combined with it; the proportions, according to Fourcroy's analysis, being 81 of oxide, 16 of muriatic acid, and 3 of ammonia. It is this precipitate which is formed in both processes. In the first, it may be conceived, that the potash of the subcarbonate of potash decomposes the muriate of ammonia, by combining with the muriatic acid, and that the ammonia evolved from this decomposes the muriate of mercury, throwing down the white precipitate the same as when ammonia is added directly to a solution of corrosive muriate; or, what affords a more simple, and perhaps a more just view, the potash attracts the greater part of the acid, both of the muriate of mercury and muriate of ammonia, and the oxide of mercury is precipitated, retaining a portion of the acid combined with it, and having attracted the quantity of ammonia necessary to the constitution of the ternary compound. The other process, that in the Dublin Pharmacopœia, is simply the decomposition of corrosive muriate of mercury by ammonia. In the preparation of the mild muriate of mercury by precipitation, it has already been stated, that if a solution of mercury in nitric acid be used, which has been prepared with the application of heat, and which therefore contains the metal more highly oxidated than the *minimum*, a portion of corrosive muriate of mercury is formed, when the solution is decomposed by muriate of soda. It is such a mercurial solution that is ordered in the Dublin Pharmacopœia for the preparation of the precipitated submuriate, and hence the liquor from which the precipitate subsides holds corrosive muriate dissolved. When decomposed, therefore, by ammonia, as directed by the present formula, it affords the ternary white precipitate. The name given to this preparation by the Dublin College is preferable to that in the London Pharmacopœia, which is altogether vague. Submurias Hydrargyri et Ammoniæ is the correct appellation. The necessity of the presence of ammonia to its constitution is very well shewn from the fact, that if the corrosive muriate be decomposed by potash, a yellow precipitate is thrown down; when the white precipitate is decomposed by heat, ammonia and nitrogen are evolved.

This precipitate, when dried, forms a light white powder, which is tasteless and insoluble in water. It is used only externally, generally under the form of ointment, in some cutaneous affections.

Hydrargyri Sulphuretum Rubrum. Red Sulphuret of Quicksilver. Lond.

"Take of Purified Quicksilver, forty ounces; Sublimed Sulphur, eight ounces. To the sulphur melted over the fire, add the quicksilver, and as soon as the mass swells, remove the vessel from the fire, and cover it closely, that inflammation may not take place; then rub it into powder, and sublime."

Sulphuretum Hydrargyri Rubrum. Red Sulphuret of Quicksilver. Dub.

"Take of Purified Quicksilver, forty ounces; Sublimed Sulphur, eight ounces. Mix the quicksilver with the sulphur melted, and if the mixture inflame, extinguish the flame by covering the vessel; then let the matter rubbed to powder be sublimed."

The inflammation which is taken notice of, as liable to happen when the melted sulphur and quicksilver are mingled together, is not a real combustion, but the evolution of heat and light from their mutual action; this taking place in other cases of the combination of sulphur with metals, and being wholly unconnected with any agency of the air. The covering of the vessel will therefore not check it, though the removal of it from the fire may do so, by reducing the temperature, and thus suspending the mutual action of the mercury and sulphur. If this should happen, the combination will probably remain imperfect, and the process may succeed less perfectly, or at least succeed only from the action being renewed in the subsequent sublimation. The exclusion of the air must, however, be proper, as preventing a real combustion taking place when the mass is so much heated. Different opinions have been maintained with regard to the nature of the product of this process. Some chemists supposed, that the mercury exists in the state of oxide, in combination with the sulphur, and Vauquelin considered the bright red colour as arising from a high degree of oxidation; this oxygen being supposed to be combined with the metal in the first stage of the process, when the apparent combustion takes place. This oxygenation, however, has never been clearly established. And according to Proust and Seguin, the compound is a pure sulphuret, consisting of 85 or 86 of quicksilver, with 15 or 14 of sulphur.

This substance, long known by the name of Cinnebar, is of a vivid red colour, which becomes still more bright when it is reduced to powder. Its principal medicinal application is for mercurial fumigation. It is easily volatilized by heat, and its vapour, directed on the surface of venereal ulcers, checks the progress of the ulceration; and where it is of importance to do so speedily, as from the situation of an ulcer it sometimes is, the practice is employed, a little of the powder being laid on a hot iron, and the vapour directed on the part. When applied, however, in this manner to an ulcer in the throat, which is the most common application of mercurial fumigation, its sulphureous vapour, proves irritating, and hence the grey oxide is sometimes preferred.

PLUMBUM.—LEAD.

Acetas Plumbi. Acetate of Lead. Ed.

"Take of White Oxide of Lead, any quantity; weak Acetic Acid, as much as may be necessary. Pour over the oxide in a cucurbit, ten times

its weight of Acid. Let the mixture stand on warm sand until the acid become sweet; pour it off, and add a fresh quantity successively, until it cease to acquire sweetness. Then evaporate the whole liquor, freed from impurities, in a glass vessel, to the consistence of thin honey, and put it aside in a cool place, that crystals may form, which are to be dried in the shade. Evaporate the remaining liquor, that there may be a new formation of crystals, and repeat this until no more are formed."

PLUMBI SUPERACETAS. Superacetate of Lead. Lond.

"Take of Carbonate of Lead, a pound; Distilled Vinegar, a gallon and a half. Boil the carbonate of lead with the acetic acid, until it be saturated, then strain through paper, and having evaporated the water until a pellicle appear at the surface, put it aside, that crystals may be formed. Having poured off the water, dry them on bibulous paper."

ACETAS PLUMBI. Acetate of Lead. Dub.

"Take of Subacetate of Lead, Cerusse as it is named, any quantity; Distilled Vinegar, ten times its weight. Digest in a glass vessel until the vinegar become sweet, which being poured off, add more until it cease to acquire sweetness. Strain the liquor, and by alternate slow evaporation and cooling, form crystals, which dry in the shade."

This process is not attempted in the shops, but is conducted on a large scale, to furnish the salt for the purposes to which it is applied in the arts; distilled vinegar being either boiled on cerusse until the acid is saturated, or plates of lead being moistened with vinegar, or partially immersed in it, until they are incrusted with oxide, this oxide being dissolved by immersing the plates in the liquor, and a new quantity being formed by raising them to the surface. This is continued until the acid is saturated, and then the liquor is brought by evaporation to crystallize.

It is obvious, that the acetic acid of the distilled vinegar combines with the oxide of lead. The salt which crystallizes was supposed to be the neutral acetate: but it appears to be a superacetate, and this name is accordingly given to it by the London College. The neutral acetate does not crystallize easily; and it was found by Thenard, whose attention was called to it, from this circumstance, that a slight excess of acid favours the crystallization, and that this excess of acid enters into the composition of the salt. It consists, according to the analysis of it by this chemist, of 58 oxide of lead, 26 acetic acid, and 16 of water, while the neutral salt is composed of 78 of oxide of lead, 17 acetic acid, and 5 of water.

This salt crystallizes in acicular prisms, and, as prepared on a large scale, is usually in the form of masses composed of these crystals aggregated; it is white, or of a light yellowish colour, with a silky lustre; is rather efflorescent; it has a sweet taste, whence the name of Sugar of Lead, by which it has been known, this sweetness being accompanied with a degree of astringency. It is soluble in water, requiring not more than three parts at 60° for its solution; with spring water, the solution is milky, from a partial decomposition of the salt, by the minute quantity of sulphates or muriates contained in the water; and even with distilled water the solution is not perfectly transparent, if a large quantity of the water be employed; the water, when its affinity to the acid is aided by its quantity, producing a slight partial decomposition.

Acetate, or rather superacetate of lead, is employed principally as an external application. Its solution in water is used as a collyrium in ophthalmia, as an astringent injection in gonorrhœa, as a wash in superficial

inflammation; and dissolved in vinegar, it is employed as a discutient. These applications of it have already been pointed out under its medical history.

Liquor Plumbi Subacetatis. Liquor of Subacetate of Lead. Lond.

"Take of the Semi-vitrified Oxide of Lead, two pounds; Acetic Acid (Distilled Vinegar), one gallon. Mix them, and boil down to six pints, stirring constantly: then put aside, that the impurities may subside, and strain."

Liquor Subacetatis Lithargyri. Liquor of Subacetate of Litharge. Dub.

"Take of Litharge, a pound; Distilled Vinegar, eight pints. Put into a glass vessel, and boil down to six pounds, stirring constantly; then pour off the liquor, after the impurities have subsided, and strain it."

This preparation was introduced by Goulard, a French surgeon, under the name of Extract of Lead, as possessed of peculiar powers, and from the confidence with which it was recommended was established in practice. It was considered by the chemists as a solution merely of oxide of lead in acetic acid, analogous to the crystallized salt. But from the examination of it by Dr. Bostock, it is proved to have no excess of acid, but to consist of the neutral acetate dissolved in water, and hence the solution is largely impregnated with oxide of lead. One hundred parts of the saturated solution contain, according to his analysis, 23.1 of oxide, 5 of acetic acid, and 71.9 of water, while 100 parts of the saturated solution of the superacetate contain 16.8 of oxide, 7.5 of acid, and 75.7 of water. The distilled vinegar cannot dissolve much more than one-third of the quantity of litharge ordered in the London Pharmacopœia, and as the residue retains part of the solution, mixed with it, the process by this excess of litharge, is rendered unnecessarily expensive. The solution, or Goulard's Extract as it is named, is of a brown colour. When kept, it becomes lighter, and deposites a quantity of oxide. It is used as a discutient, being mixed with vinegar and water, and frequently applied under the form of cataplasm. It forms also an application to inflamed surfaces, generally under the form of the following preparation, which has been admitted as officinal by the London and Dublin Colleges.

Liquor Plumbi Subacetatis Dilutus. Dilute Liquor of Subacetate of Lead. Lond.

"Take of Liquor of Subacetate of Lead, a drachm; Distilled Water, a pint; Proof-spirit, a fluiddrachm. Mix them."

Liquor Subacetatis Lithargyri Compositus. Compound Liquor of Subacetate of Litharge. Dub.

"Take of Liquor of Subacetate of Litharge, two drachms by weight; Distilled Water, two pints; Proof-spirit, two drachms. Mix the spirit and the subacetate of litharge; then add the distilled water."

This is what Gourland named absurdly Vegeto-Mineral Water, and which has been highly celebrated as an application in superficial inflammation. It is occasionally employed by surgeons, and some have thought it superior to a simple solution of acetate or superacetate of lead.

ZINCUM.—ZINC.

Carbonas Zinci Impurus Præparatus. Prepared Impure Carbonate of Zinc. Ed.

"Procure the impure Carbonate of Zinc, roasted, from those who prepare brass, and let it be prepared in the same manner as Carbonate of Lime."

Calamina Præparata. Prepared Calamine. Lond.

"Calcine Calamine; then rub it to powder. Lastly, reduce it to a very fine powder in the manner directed for preparing chalk."

Lapis Calaminaris Præparatus. Prepared Calamine. Dub.

"Reduce Calcined Calamine Stone into powder, and separate the finer particles in the manner ordered in the preparation of chalk."

Calamine is an ore of zinc, the composition of which is variable. Some varieties of it appear to consist of oxide of zinc, combined with siliceous earth; but the more common varieties are composed of the carbonate more or less pure. When calcined by a moderate heat, it becomes friable, so as to be more easily reduced to powder; and as this calcination is performed in preparing it for converting copper into brass by cementation, it is ordered in the Edinburgh Pharmacopœia to be obtained in this state, and then to be reduced to a fine powder by levigation and washing in the same manner as carbonate of lime. Considerable care requires to be taken in this levigation, as the powder is applied to purposes, where, if it were coarse, it would prove irritating. It is used as an application to superficial inflammation and excoriation, dusted on the part; and it forms the basis of the common cerate, to which it communicates consistence and tenacity.

Oxidum Zinci Impurum Præparatum. Prepared Impure Oxide of Zinc. Ed.

"This Oxide of Zinc is prepared in the same manner as the Impure Carbonate of Zinc."

Tutia, the former name of this oxide, is a substance, the origin of which is somewhat doubtful; it consists of oxide of zince with argillaceous earth; and the most probable account with regard to it is, that it is the sublimate collected in the chimneys in which zinc is calcined, mixed with clay and water, and baked. It is used externally for the same purposes as calamine, and hence requires to be well levigated.

Oxidum Zinci. Oxide of Zinc. Ed.

"Let a large crucible be placed in a furnace filled with burning fuel, in such a manner that it shall be somewhat inclined to its mouth; and when the bottom of the crucible is at a moderate red heat, throw in a piece of zinc, about the weight of one drachm. The zinc soon inflames, and is converted into white flocculi, which are to be removed, from time to time, from the surface of the metal, with an iron spatula, that the combustion may proceed more perfectly; and, when the inflammation ceases, remove the oxide of zinc from the crucible. Another piece of zinc being thrown in, the operation is to be renewed and repeated as often as may be necessary. Lastly, let the oxide of zinc be prepared in the same manner as Impure Carbonate of Zinc."

Zinci Oxydum. Oxyd of Zinc. Lond.

"Throw successively pieces of Zinc into a red-hot crucible, large, deep, and inclined; another crucible being placed over it, in such a man-

ner that the zinc may be exposed to the air, and may admit of being stirred frequently with an iron spatula. Remove immediately the oxide which is produced, and pass the white and lighter part of it through a sieve. Lastly, pour water on this, so as to form a fine powder in the manner directed for preparing chalk."

Oxydum Zinci. Oxide of Zinc. Dub.

"Take of Zinc broken into small pieces, any quantity. Throw these at intervals into a crucible at a red heat, sufficiently deep, the mouth of which inclines a little towards the mouth of the furnace, placing over it at each time another crucible inverted, but covering it loosely so that the air may not be excluded. Let the light and very white sublimed powder be preserved for use."

Zinc is the most inflammable of the metals. At the temperature of ignition, it attracts the oxygen of the atmospheric air, and burns vividly with a white and green light, producing an oxide in very light flocculi, which are in part carried off by the rapid current of air arising from the burning zinc; and hence the reason of the direction to cover the crucible, with another inverted, so that this may be obviated,—a direction, however, not easily complied with, without impeding the burning. The oxide accumulates so rapidly, that it must also be withdrawn to allow the combustion to proceed. Particles of metallic zinc are intermingled with it, and hence the necessity of submitting it to levigation. It is light, white, tasteless, and insoluble in water, and contains about 20 of oxygen in 100 parts. In medicine it is employed principally as an antispasmodic in epilepsy and chorea. Its dose is from two to five grains twice a-day, and this is gradually increased. It also forms the basis of a healing cerate.

Sulphas Zinci. Sulphate of Zinc. Ed.

"Take of Zinc cut into small pieces, three parts; Sulphuric Acid, five parts; Water, twenty parts. Mix them, and the effervescence being finished, digest for some time on warm sand. Then strain the liquor, after being decanted, through paper; and after due exhalation, put it aside, that crystals may be formed."

Zinci Sulphas. Sulphate of Zinc. Lond.

"Take of Zinc in small pieces, three ounces; Sulphuric Acid, by weight five ounces; Water, four pints. Mix them in a glass vessel, and the effervescence being over, strain the liquor through paper; then boil it until a pellicle form on the surface, and put it aside that crystals may form."

Sulphas Zinci. Sulphate of Zinc. Dub.

"Take of Zinc reduced to powder, in the same manner that tin is, three ounces; Sulphuric Acid, five ounces; Water, a pint. To the zinc put into a glass vessel, add gradually the acid previously diluted with the water; when the effervescence ceases, digest for a short time; then evaporate the strained liquor, and after due evaporation, put it aside, that crystals may form."

The sulphuric acid, in this process, by a resulting affinity, enables the zinc to decompose the water, attracting its oxygen, the hydrogen being disengaged with effervescence: the oxide of zinc combines with the acid, forming the sulphate, and by evaporation this is obtained in acicular crystals. The process, however, is scarcely ever performed in the shops, the sulphate of zinc being prepared on a large scale, from certain varieties

of the native sulphuret of the metal. These are roasted, and exposed to air and humidity; oxygen is absorbed, the zinc is oxidated, and the sulphur is converted into sulphuric acid; the sulphate of zinc is extracted by lixiviation; and its solution is evaporated so far, that on cooling, the salt concretes in a granular mass, forming the white vitriol of commerce. It usually contains a little sulphate of iron, and sometimes, it has been supposed, a portion of sulphate of copper and of lead. From the insolubility of the latter salt, it can scarcely be present; the sulphate of copper is scarcely ever to be discovered, and the sulphate of iron is in small quantity, and cannot communicate any injurious quality. And as sulphate of zinc is principally employed externally, the neglect of this process, and the substitution of the common white vitriol, are of less importance.

Sulphate of zinc is used principally as an astringent, in the form of solution; as an injection in gonorrhœa, and a collyrium in ophthalmia: sometimes also internally as an emetic, and in smaller doses as an astringent and tonic. These applications of it have been already considered.

Solutio Sulphatis Zinci. Solution of Sulphate of Zinc. Ed.

"Take of Sulphate of Zinc, sixteen grains; Water, eight ounces; Diluted Sulphuric Acid, sixteen drops. Dissolve the sulphate of zinc in water; then the acid being added, strain through paper."

This solution is designed to be used as a collyrium in ophthalmia, the sulphuric acid dissolving any excess of oxide that may be present in the common sulphate of zinc, if it be employed, and coinciding with it in astringency. As an injection in gonorrhœa, the solution, without the acid, is preferable, as sufficiently astringent and less irritating, and perhaps is equally preferable as a collyrium.

Solutio Acetatis Zinci. Solution of Acetate of Zinc. Ed.

"Take of Sulphate of Zinc, one drachm; Acetate of Lead, four scruples; Distilled Water, twenty ounces. Dissolve the salts separately in ten ounces of water each; mix the solutions, and, after the liquor has settled, strain it."

Sulphate of zinc and acetate of lead being the two astringent salts which usually form the basis of the astringent injection employed in gonorrhœa, they had frequently been conjoined in one formula, without the prescriber perhaps being always aware of the decomposition they suffer. The solution, however, was found to be astringent without proving irritating. The use of it led to the introduction of the present process, in which the proportions are properly adjusted. The two salts exchange their principles, the sulphuric acid of the sulphate of zinc combining with the oxide of lead of the acetate of lead, while the acetic acid unites with the oxide of zinc: the sulphate of lead being insoluble is precipitated, and is removed by filtration; the acetate of zinc remains dissolved. It is used both as an injection in gonorrhœa, and a collyrium in ophthalmia.

Tinctura Acetatis Zinci. Tincture of Acetate of Zinc. Dub.

"Take of Sulphate of Zinc, one ounce; Acetate of Potash, the same quantity. Triturate them together, and add of Rectified Spirit, one pint. Macerate for a week, agitating the liquor frequently, and strain it through paper."

In this process a similar decomposition takes place, the sulphuric acid

of the sulphate of zinc combining with the potash of the acetate of potash, while the acetic acid enters into union with the oxide of zinc. The spirit dissolves the acetate of zinc, while the sulphate of potash remains in a great measure undissolved. The solution is strongly impregnated with the metallic salt, and a collyrium or injection of the usual strength may be prepared extemporaneously, by adding a certain proportion of it to water, though it requires much larger dilution than is proportional to the quantity of acetate of zinc it contains, to reduce the stimulant operation of the spirit. The formula appears to have no advantage over the more direct and simple method given by the Edinburgh College.

STANNUM.—TIN.

Pulvis Stanni. Powder of Tin. Dub.

"Take of Tin, any quantity. Having melted it in an iron mortar, agitate it as it cools, until it is reduced to powder, which, when cold, is to be passed through a sieve."

Tin, when heated near to its melting point, becomes brittle, so as to be easily reduced to fragments. When melted, therefore, if stirred or agitated as it becomes solid, this effect is obtained, and a granular powder is formed more easily than by any other method. Its powers as an anthelmintic have been already considered.

CHAP. XXIV.

SULPHUREA.—PREPARATIONS OF SULPHUR.

Oleum Sulphuratum. Sulphurated Oil. Ed.

"Take of Olive Oil, eight parts; Sublimed Sulphur, one part. Boil with a gentle fire, in a large iron pot, stirring constantly until they unite."

Oleum Sulphuratum. Sulphurated Oil. Lond.

"Take of Washed Sulphur, two ounces; Olive Oil, a pint. Add the sulphur gradually to the oil heated in a large iron vessel, and stir constantly with a spatula until they unite."

This process, though apparently simple, is attended with some difficulty, the oil being very liable to boil over, or its vapour to catch fire: the heat therefore requires to be applied with caution, and a large vessel ought to be employed. It is one too unnecessary, for although the composition has been recommended in catarrh, asthma, and phthisis, it has fallen into disuse, being acrid and offensive. When employed, it was given in a dose of from 10 to 30 drops.

Sulphur Sublimatum Lotum. Washed Sublimed Sulphur. Ed.

"Take of Sublimed Sulphur, one part; Water, four parts. Boil the sulphur for a short time in the water; then pour off this water, and adding cold water wash away all the acid; Lastly, dry the sulphur."

Sulphur Lotum. Washed Sulphur. Lond.

"Take of Sublimed Sulphur, a pound. Pour upon it boiling water, that the acid, if there is any, may be washed out: then dry."

Sulphur Sublimatum Lotum. Washed Sublimed Sulphur. Dub.

"Let warm water be poured on sublimed sulphur, and let the washing be repeated as long as the water poured off has received any acidity, which may be known by the test of litmus. Dry the sulphur on bibulous paper."

The sublimation of sulphur is usually conducted on a large scale, and the vapours of the sulphur, which first rise, receiving a little oxygen from the atmospheric air of the subliming vessel, or of the chamber in which they are condensed, a slight degree of acidity is liable to be acquired, which it is the object of this process to remove. Any acidity, however, is so slight, that it is scarcely perceptible in the sublimed sulphur of the shops; the process is therefore superfluous, and is never attended to. By the washing the bright yellow colour of the sulphur is removed, and it acquires more of a greenish-grey tinge.

Sulphur Præcipitatum. Precipitated Sulphur. Lond.

"Take of Sublimed Sulphur, one pound; Lime recently prepared, two pounds; Water, four gallons. Boil the sulphur and the lime together in the water; strain the liquor through paper, and drop into it muriatic acid, as much as may be sufficient to precipitate the sulphur. Lastly, pouring water on this frequently, wash it until it remain tasteless."

The sulphur is in the first stage of this process combined with the lime; and at the same time, as always happens when sulphur is enabled to act on water by the resulting affinity of an alkaline base, a decomposition of a portion of the water takes place; its oxygen unites with a little of the sulphur, and forms sulphuric acid, with which part of the base combines; the hydrogen of the decomposed water unites with another portion of sulphur, forming sulphuretted hydrogen, and this enters into combination with the remaining sulphur and base, and by its affinity prevents any farther decomposition. The solution, therefore, besides the small portion of sulphate which it may contain, is a ternary compound of sulphur, sulphuretted hydrogen, and the alkaline or earthy base. When an acid is added, it combines with the base, and precipitates the sulphur, while the small quantity of sulphuretted hydrogen is disengaged in the elastic form. In the present process, therefore, the liquor is a compound of lime, sulphur, and sulphuretted hydrogen,—what may be named a Sulphuretted Hydrosulphuret of Lime. The muriatic acid, when added to it, combines with the lime; and this muriate of lime being very soluble, remains dissolved in the water; sulphuretted hydrogen is disengaged; and sulphur, being insoluble, is precipitated.

The process, under this point of view, may be supposed to have no object, as the sulphur is merely recovered; and it cannot indeed be said to have much advantage. The precipitated sulphur, however, is of a whiter colour than sublimed sulphur, and is therefore preferred in making sulphur ointment, the only purpose to which it is applied. This whiteness may be owing either to its state of aggregation, or to its combination with a little water, for the yellow colour is restored on melting it. That it is owing to the presence of water, is rendered probable, from the same whiteness being produced by dropping water on melted sulphur, or receiving the vapours of sulphur in a vessel filled with watery vapour. Common sulphur, it appears from the younger Berthollet's experiments, contains hydrogen; and it is not improbable, that precipitated sulphur may contain a larger

proportion of hydrogen, which it may attract in its precipitation. The whiteness of the precipitated sulphur of the shops is usually increased by precipitating the solution of the sulphuretted hydro-sulphuret of lime, not by muriatic, but by sulphuric acid, sulphate of lime being thus formed and thrown down, intimately mingled with the sulphur. But this renders it less pure, and therefore less fit for internal administration.

SULPHURETUM POTASSÆ. Sulphuret of Potash. Ed.

"Take of Subcarbonate of Potash, two parts; Sublimed Sulphur, one part. Having rubbed them together, put them into a large coated crucible: and a cover being adapted to it, apply the fire to it cautiously, until they melt. The crucible, after it has cooled, being broken, remove the sulphuret, and preserve it in a phial well stopt."

POTASSÆ SULPHURETUM. Sulphuret of Potash. Lond.

"Take of Washed Sulphur, an ounce; of Subcarbonate of Potash, two ounces. Rub them together, and put them into a close crucible upon the fire until they unite."

SULPHURETUM KALI. Sulphuret of Potash. Dub.

"Take of Subcarbonate of Potash, Sublimed Sulphur, of each two ounces. Put them mixed together into a crucible, and applying a cover, expose them to a fire gradually raised, until they unite."

During the fusion of the two substances, the sulphur and potash combine, and the carbonic acid is disengaged, only partially however, and hence the combination is less perfect than when the sulphur is melted with the pure alkali. From the larger proportion of potash ordered in the formula of the London Colleges, the combination is probably more perfect, and the whole sulphur will be rendered soluble in water. The compound is of a yellowish-green or brown colour, and inodorous, but becomes fœtid when moistened or dissolved in water, from partial decomposition, and the production of a compound of sulphur and hydrogen. It has been proposed to be used as an antidote to some of the metallic poisons, from the supposition that the sulphur will combine with the metallic preparation, and render it inert. From a similar theory, it has been imagined that it might obviate the effects of mercury on the system when these are too violent; but it is seldom had recourse to with either intention, and it is doubtful if much advantage would be derived from it. The dose in which it has been proposed to be given is from ten to twenty grains, three or four times a-day. It is said, in some cases of cancer, to have increased the efficacy of cicuta as a palliative, in doses of five grains. Externally, it has been recommended in tinea capitis; a wash prepared from three drachms of it with an ounce of soap, dissolved in eight ounces of lime-water, with the addition of two drachms of ardent spirit, being applied to the scalp.

CHAP. XXV.

PULVERES.—POWDERS.

THIS is the simplest form of composition of medicines, the different articles being merely reduced to powder, and mixed together. It is adapted to the exhibition of such remedies as are not ungrateful, and such as are

not liable to lose their virtues by keeping; and is usually an improper form for those which are bitter, acrid, or fœtid, which require to be given in a large dose, or which are not easily diffused in water, the vehicle in which powders are usually taken. The dose of a powder seldom exceeds a drachm; and if it require to be given only in a few grains, it is better that it should be under the form of bolus. When it is to be taken, it is merely diffused in water, wine, or any other convenient vehicle. The Dublin College give the following general directions for the preparations of powders:

"Those substances which are to be reduced to powders, after being first dried, are to be pulverised in an iron mortar. The powder is then to be separated, by shaking it through a hair sieve, and is to be preserved in a close vessel."

Pulvis Aromaticus. Aromatic Powder. Ed.

"Take of Bark of Cinnamon, Cardamom Seeds, Ginger Root, of each equal parts. Rub them into a very fine powder, which is to be kept in a glass phial well stopt."

Pulvis Cinnamomi Compositus. Compound Powder of Cinnamon. Lond.

"Take of Bark of Cinnamon, two ounces; Cardamom Seeds, an ounce and a half; Ginger Root, an ounce; Long Pepper, half an ounce. Rub them together so as to form a fine powder."

Pulvis Aromaticus. Aromatic Powder. Dub.

"Take of Cinnamon, two ounces; Smaller Cardamom Seeds freed from the capsules, Ginger, Long Pepper, of each one ounce. Rub them together to a powder."

This combination of aromatics is designed to communicate to other compositions fragrance and pungency, and to obviate the nausea which ungrateful medicines are liable to excite. The quantity added to a dose is generally about five grains.

Pulvis Asari Compositus. Compound Powder of Asarabacca. Ed.

"Take of the Leaves of Asarabacca, three parts; the Leaves of Marjoram, Flowers of Lavender, of each one part. Rub them together to a powder."

Pulvis Asari Compositus. Compound Powder of Asarabacca. Dub.

"Take of the Leaves of Asarabacca dried, an ounce; Flowers of Lavender dried, two drachms. Rub them together, and form a powder."

This is a mild errhine, forming the composition known by the name of Herb Snuff. When snuffed in the quantity of a few grains, it occasions sneezing and a discharge of mucus, and is sometimes used in headach and ophthalmia.

Pulvis Carbonatis Calcis Compositus. Compound Powder of Carbonate of Lime. Ed.

"Take of Prepared Carbonate of Lime; four ounces; Bark of Cinnamon, one drachm and a half; Nutmeg, half a drachm. Rub them together to powder."

This is designed to be used as a grateful antacid. It is given in the dose of one drachm.

Pulvis Cretæ Compositus. Compound Powder of Chalk. Lond.

"Take of Prepared Chalk, half a pound; Bark of Cinnamon, four oun-

ces; Tormentil Root, Gum-Arabic, of each three ounces; Long Pepper, half an ounce. Reduce them separately to powder, and mix them."

In this composition, though analogous to the preceding one, the proportion of the aromatics is larger, and the addition of the tormentil root renders it more astringent. It is used to relieve diarrhœa arising from acidity, being given in the dose of half a drachm or a drachm.

Pulvis Cretæ Compositus cum Opio. Compound Powder of Chalk with Opium. Lond.

"Take of Compound Powder of Chalk, six ounces and a half; Hard Opium, rubbed to powder, four scruples. Mix them."

The addition of opium to astringents and antacids, when given in diarrhœa, is a common practice, and this formula affords a convenient composition of this kind. Its dose is one scruple, or half a drachm. Two scruples contain one grain of opium.

Pulvis Jalapæ Compositus. Compound Powder of Jalap. Ed.

"Take of the Powder of the Root of Jalap, one part; Supertartrate of Potash, two parts. Rub them together into a very fine powder."

This combination affords an excellent purgative, less stimulating, and less liable to excite griping than jalap alone. It is given in the dose of a drachm; and in dropsy, as a hydragogue cathartic, to the exent of two drachms.

Pulvis Ipecacuanhæ et Opii. Powder of Ipecacuanha and Opium. Ed.

"Take of the Powder of the Root of Ipecacuanha, Opium, of each one part; Sulphate of Potash, eight parts. Rub them together into a fine powder."

Pulvis Ipecacuanhæ Compositus. Compound Powder of Ipecacuanha. Lond.

"Take of Root of Ipecacuanha in Powder, Hard Opium in powder, of each a drachm; Sulphate of Potash, one ounce. Mix them."

Pulvis Ipecacuanhæ Compositus. Compound Powder of Ipecacuanha. Dub.

"Take of Ipecacuanha Root, Hard Purified Opium, of each reduced to powder, one drachm; Sulphate of Potash, one ounce. Rub them together, and form a powder."

This composition, Dover's Powder, has long been established in practice, and is one of those useful combinations which experience, or rather accident, discovers, the powers of which could not have been inferred *a priori* from the known operation of its ingredients. Its affords one of the best examples of the power which one medicine has of modifying the action of another, the ipecacuan rendering the operation of the opium, as a sudorific, more certain than it otherwise would be, and appearing also to diminish its narcotic effect, so that the composition can be given with safety in inflammatory affections, in which opium alone would be hazardous.—The sulphate of potash serves to divide the particles of the opium and ipecacuan, and mix them more intimately; and such is the advantage derived from it, that, as Dr. Blane has remarked, the opium and ipecacuan alone, mixed in the above proportions, have the same effect. Hence, too, the operation of the powder is always more certain when it has been triturated to a great degree of fineness, and the directions in some of the

Pharmacopœias are in this respect imperfect. This powder is the most powerful and certain sudorific we possess. Its medium dose is fifteen grains, the operation of which is to be assisted by the sweating regimen; and frequently it is necessary to give additional smaller doses at intervals, to produce heat. Its principal use is in acute rheumatism; but it is prescribed in all cases with propriety where full sweating is to be induced.

Pulvis Opiatus. Opiate Powder. Ed.

"Take of Opium, one part; Prepared Carbonate of Lime, nine parts. Rub them together to a fine powder."

This is designed as a convenient form for administering opium. Ten grains contain a grain of opium, and form a medium dose. It is, however, little used.

Pulvis Cornu Usti cum Opio. Powder of Burnt Hartshorn with Opium. Lond.

"Take of Hard Opium rubbed to powder, one drachm; Burnt and Prepared Hartshorn, an ounce; Cochineal in powder, a drachm. Mix them."

This, in a former edition of the Pharmacopœia, had the name of Pulvis Opiatus, which has been changed to its present appellation, as being less liable to be confounded with Powder of Opium. A little cochineal is added to give it colour. The burnt hartshorn divides the opium, and from its hardness and grittiness is better adapted to this than the chalk of the preceding preparation. One grain of opium is contained in ten of the powder.

Pulvis Salinus Compositus. Compound Saline Powder. Ed.

"Take of Pure Muriate of Soda, Sulphate of Magnesia, of each four part; Sulphate of Potash, three parts. Rub the salts, previously dried by a gentle heat, separately to a fine powder, and then together. The powder should be kept in a vessel well corked."

This is a very pleasant cathartic, and very well adapted to those who are of a costive habit. The dose is a drachm taken in water, or any other convenient vehicle.

Pulvis Scammonii Compositus. Compound Powder of Scammony. Ed.

"Take of Scammony, Supertartrate of Potash, of each equal parts. Rub them together into a very fine powder."

Scammony alone is liable to act with violence, while its operation is at the same time somewhat uncertain. By the addition of the supertartrate of potash, its cathartic operation is rendered more certain and less irritating. It is also preferred to the scammony alone, as a hydragogue cathartic. Its dose is from ten to twenty grains.

Pulvis Scammonii Compositus. Compound Powder of Scammony. Lond.

"Take of Scammony, Hard Extract of Jalap, of each two ounces; Ginger, half an ounce. Rub them separately into a very fine powder, then mix them."

This composition, though under the same name as the preceding one, is of a very different nature; the stimulating operation of the scammony not being corrected, but rather increased by the addition of the extract of jalap. The ginger will communicate an aromatic pungency, and obviate

griping. The compound is a strong cathartic. Its medium dose is ten grains.

Pulvis Aluminis Compositus. Compound Powder of Alumine. Ed.
"Take of Alumine, four parts; Kino, one part. Rub them together into a fine powder."

This being a combination of two powerful astringents, has been sometimes used internally in menorrhagia, in repeated doses of ten or fifteen grains, and externally as a styptic application to bleeding wounds.

The following Powders have a place in the London or Dublin Pharmacopœia, without any preparations corresponding to them in the Edinburgh Pharmacopœia.

Pulvis Aloes Compositus. Compound Powder of Aloes. Lond.
"Take of Socotorine Aloes, one ounce and a half; Guaiac Gum-Resin one ounce: Compound Powder of Cinnamon, half an ounce. Rub the aloes and guaiac separately into powder; then mix them with the compound powder of cinnamon."

Pulvis Aloes cum Guaiaco. Powder of Aloes with Guaiac. Dub.
"Take of Hepatic Aloes, an ounce and a half; Gum-Resin of Guaiac, an ounce; Aromatic Powder, half an ounce. Rub the aloes and guaiac separately to powder; then mix them with the aromatic powder."

This combination of aloes with guaiac is designed as a stimulating aperient, and may be given in a dose of fifteen or twenty grains. The form of powder is however ill adapted to the exhibition of a substance so bitter and nauseous as aloes, or of resinous substances, such as guaiac; and the composition is therefore little used.

Pulvis Aloes cum Canella. Powder of Aloes with Canella. Dub.
"Take of Hepatic Aloes, one pound; White Canella, three ounces. Rub them separately to powder; then mix them."

This had a place in a former edition of the London Pharmacopœia, but is now thrown out. The canella covers the unpleasant flavour of the aloes: and this combination is sometimes used as a warm stimulating cathartic, not under the form of powder, but made into a tincture, by infusing it in spirit. A composition of this kind, designed for this purpose, has long been kept in the shops, under the name of Hiera Picra.

Pulvis Contrayervæ Compositus. Compound Powder of Contrayerva. Lond.
"Take of Contrayerva Root, rubbed to Powder, five ounces; Prepared Shells, one pound and a half. Mix them."

This is a composition which has long kept its place in the Pharmacopœias, and has been often reformed. It is scarcely adapted to any important purpose, or possessed of any advantage. It has been given as a tonic and stimulating diaphoretic, in a dose of half a drachm.

Pulvis Kino Compositus. Compound Powder of Kino. Lond.
"Take of Kino, fifteen drachms; Cinnamon Bark, half an ounce; Hard Opium, a drachm. Triturate them separately into a very fine powder, then mix them."

Kino is one of the most powerful vegetable astringents. The cinnamon will communicate to it a grateful aromatic flavour and pungency, and the addition of the opium will render it a more powerful remedy in diarrhœa. Yet the form of powder is not well adapted to its administration; nor does there appear any particular reason for introducing this as an officinal preparation. It may be given in a dose from ten to twenty grains.

PULVIS SENNÆ COMPOSITUS. Compound Powder of Senna. Lond.

"Take of Leaves of Senna, Supertartrate of Potash, of each two ounces; Scammony, half an ounce; Ginger, two drachms. Rub the scammony separately, the others together, into a fine powder, and mix them."

This may be employed as a purgative, in a dose of from half a drachm to a drachm. The senna is, however, so inferior in power to the scammony, that there appears to be little advantage in their combination, nor is the form of powder well adapted to their exhibition.

PULVIS TRAGACANTHÆ COMPOSITUS. Compound Powder of Tragacanth. Lond.

"Take of Tragacanth, rubbed to powder, Gum-Arabic in powder, Starch, of each one ounce and a half; Refined Sugar, three ounces. Triturate the starch and sugar together into powder, then having added the tragacanth and the gum-arabic, mix them all together."

This combination of mucilaginous substances may be employed for the general purposes of demulcents, in the dose of a drachm, or two drachms, frequently repeated. But it appears to be a very superfluous composition.

CHAP. XXVI.

ELECTUARIA.—ELECTUARIES.

THIS term is applied to that form of compound medicines where the consistence is nearly that of thick honey. An electuary is composed, in general, of a powder reduced to the proper consistence by the addition of syrup or mucilage. It is a proper form for administering medicines which are not very disagreeable in their taste or flavour; and, except in a few officinal preparations, it is an extemporaneous prescription, as, when long kept, it is liable to become too thick and adhesive from the evaporation of part of its moisture. Dry powders generally require twice their weight of syrup to bring them to the due consistence; and syrup is preferable to mucilage, as the electuary made with the former does not so soon become dry. The common dose of an electuary rarely exceeds two tea-spoonfuls, and is seldom less than a tea-spoonful; any very active medicine, which requires to be given in a smaller dose, being usually administered under the form of bolus.

The London College have united the Electuaries with the Conserves, as they are both compositions of vegetable matter with sugar, and are of similar consistence; and have given to them the common name of Confections. In conserves, however, the addition of the saccharine matter is in larger proportion, and is designed to preserve the vegetable matter; in

electuaries, the syrup is designed merely to communicate the required form. The Edinburgh College retain the distinction of conserves, and the preparations which have this name have been already considered.

Electuarium Aromaticum. Aromatic Electuary. Ed.

"Take of Aromatic Powder, one part; Syrup of Orange-Peel, two parts. Mix, beating them well together, so as to form an electuary."

Confectio Aromatica. Aromatic Confection. Lond.

"Take of Cinnamon Bark, Nutmegs, each two ounces; Cloves, one ounce; Cardamom Seeds, half an ounce; Saffron, dried, two ounces; Prepared Shells, sixteen ounces; Refined Sugar, two pounds; Water, a pint. Triturate the dry substances together into a fine powder, then add the water gradually, and mix them so as to form an uniform mass."

Electuarium Aromaticum. Aromatic Electuary. Dub.

"Take of Cinnamon, Nutmeg, each half an ounce; Refined Sugar, Saffron, each one ounce; Cardamom Seeds freed from the capsules, Cloves, each two drachms; Precipitated Chalk, two ounces; Syrup of Orange, as much as necessary. Reduce the aromatics separately to powder; then mix them with the syrup."

The composition of the Edinburgh Pharmacopœia is the most simple of these; in the others the carbonate of lime is foreign to the object of the combination, though, as it has long had a place, it is still retained. Either electuary is a grateful aromatic preparation, occasionally combined with other medicines, or made the basis of cordial or carminative mixtures, requiring merely for this purpose to be diffused in water with a little syrup.

Electuarium Cassiæ Fistulæ. Electuary of Purging Cassia. Ed.

"Take of the Pulp of Cassia, four parts; Pulp of Tamarind, Manna, of each one part; Syrup of Pale Rose, four parts. Dissolve the manna beat in a mortar, with a gentle heat, in the syrup; then add the pulps, and, by a continued heat, reduce the mixture to a proper consistence."

Confectio Cassiæ. Confection of Cassia. Lond.

"Take of Fresh Pulp of Cassia, half a pound; Manna, two ounces; Pulp of Tamarind, an ounce; Syrup of Rose, half a pint. Bruise the manna, then dissolve it in the syrup by the heat of a water-bath; mix in the pulps, and evaporate to a proper consistence."

Electuarium Cassiæ. Electuary of Cassia. Dub.

"Take of Pulp of Cassia, recently extracted, half a pound; Manna, two ounces; Pulp of Tamarinds, an ounce; Syrup of Orange, half a pound. Dissolve the manna bruised, with a moderate heat, in the syrup; then add the pulps, and reduce the mixture by slow evaporation to the due consistence."

This Electuary affords a mild laxative, which operates in the dose of an ounce. From the predominance of the pulps and the saccharine matter, it is liable, however, to become sour on keeping; it is also inferior in activity to the next electuary, which is equally pleasant, and hence it is so little used, that it is never found in the shops.

Electuarium Catechu Compositum. Compound Electuary of Catechu. Ed.

"Take of Extract of Catechu, four ounces: Kino, three ounces; Bark of Cinnamon, Nutmeg, of each one ounce; Opium, diffused in a sufficient

quantity of Spanish White Wine, one drachm and a half; Syrup of Red Rose, boiled to the consistence of honey, two pounds and a quarter. Reduce the solid ingredients to powder, and, mixing with them the opium and syrup, form an electuary."

Electuarium Catechu Compositum. Compound Electuary of Catechu. Dub.

"Take of Catechu, four ounces; Cinnamon, two ounces; Kino, three ounces. Rub them into powder; then add of Hard Purified Opium, a drachm and a half, diffused in Spanish White Wine; Syrup of Ginger, boiled to the consistence of honey, two pounds and a quarter. Mix the whole."

In this electuary, the more powerful vegetable astringents are combined; they are rendered more grateful by the addition of the aromatics, and the efficacy of the composition, as a remedy in diarrhœa, is increased by the opium. It is the basis of the common extemporaneous astringent mixture; two drachms of it being diffused with a little syrup in six ounces of water, and a table-spoonful of this being taken three or four times a-day. One grain of opium is contained in rather more than three drachms.

Electuarium Opiatum, *olim Electuarium Thebaicum.* Opiate Electuary. Ed.

"Take of Aromatic Powder, six ounces; Virginian Snake-root, rubbed to a fine powder, three ounces; Opium, diffused in a sufficient quantity of Spanish White Wine, half an ounce; Syrup of Ginger, one pound. Mix, so as to form an electuary."

Confectio Opii. Confection of Opium. Lond.

"Take of Hard Opium, rubbed to powder, six drachms; Long Pepper, an ounce; Ginger-root, two ounces; Caraway Seeds, three ounces; Syrup, a pint. Rub the opium with the syrup heated, then add the other ingredients ground to powder, and mix them."

This is a substitute for compositions once highly celebrated, and which have long kept their place in the Pharmacopœias of Europe, the Mithridate and Theriaca, which at one period consisted of above an hundred ingredients. Opium appeared, amid this farrago, to be the ingredient of predominating power, modified principally by aromatics; they have been, therefore, gradually reformed into the present preparation, and even it is scarcely used. Each drachm, according to the formula in the Edinburgh Pharmacopœia, contains a grain and a half of opium; and rather more according to that of the London College.

Electuarium Sennæ Compositum. Electuary of Senna. Ed.

"Take of the Leaves of Senna, eight ounces; Coriander Seeds, four ounces; Liquorice Root, bruised, three ounces; Figs, Pulp of Prunes, of each one pound; Pulp of Tamarind, half a pound; Refined Sugar, two pounds and a half; Water, two pounds. Bruise the Senna with the coriander seeds, and separate by passing through a sieve ten ounces of the mixed powder. Boil the residuum with the figs and the liquorice in the water, to one half; then express and strain. Reduce the strained liquor, by evaporation, to about a pound and half. Afterwards add the sugar gradually. Add the Pulps, and, lastly, mix in the powder."

Confectio Sennæ. Confection of Senna. Lond.

"Take of Senna Leaves, eight ounces; Figs, a pound; Pulp of Tamarind, Pulp of Cassia, Pulp of Prune, of each half a pound; Coriander

Seeds, four ounces; Liquorice Root, three ounces; Refined Sugar, two pounds and a half. Beat the senna leaves with the coriander seeds, and separate ten ounces of the mixed powder by a sieve. Boil the remainder with the figs and the liquorice root in four pints of water to one-half; then express and strain. Evaporate the strained liquor in a water-bath until only a pint and a half remain, then adding it to the sugar, form a syrup. Lastly, rub the pulps with the syrup, and sprinkling in the powder passed through the sieve, mix the whole together."

Electuarium Sennæ. Electuary of Senna. Dub.

"Take of Senna Leaves in fine powder, four ounces; Pulp of Prunes, a pound; Pulp of Tamarinds, two ounces; Syrup of Brown Sugar (Molasses), a pint and a half; Essential oil of Caraway, two drachms. Boil down the pulps in the syrup to the consistence of honey; then add the powder, and, when the mixture cools, the oil; lastly, mix them all well together."

This electuary is in common use as a mild purgative. Its dose is six drachms, or an ounce; and it is sometimes rendered more active by the addition of a little jalap, or supertartrate of potash. The electuary of the Dublin Pharmacopœia, though more simple than the others, must be less grateful, from containing so large a proportion of molasses; and the oil of caraway will communicate rather too much pungency to a medicine in this form.

It remains to take notice of those Electuaries, or Confections as they are named, peculiar to the London or Dublin Pharmacopœias.

Confectio Amygdalarum. Confection of Almonds. Lond.

"Take of Sweet Almonds, an ounce; Gum-Arabic in powder, a drachm; Refined Sugar, half an ounce. The almonds having been previously macerated in water, and their external pellicle removed, beat the whole together, until they form an uniform mass."

This is introduced as affording an easy and convenient mode of preparing the almond emulsion extemporaneously; a little of this confection forming it by diffusion in water.

Confectio Rutæ. Confection of Rue. Lond.

"Take of the Dried Leaves of Rue, Caraway Seeds, Bay Berries, of each an ounce and a half; Sagapenum, half an ounce; Black Pepper, two drachms; Clarified Honey, sixteen ounces. Triturate the dry ingredients into a fine powder; then adding the honey, mix them together."

This is intended as the basis of an enema, sometimes given in the hysteric paroxysm, and in flatulent colic.

Confectio Scammoniæ. Confection of Scammony. Lond.

"Take of Scammony Powder, an ounce and a half; Cloves bruised, Ginger-Root in powder, of each six drachms; Oil of Caraway, half a fluid-drachm; Syrup of Rose, as much as may be necessary. Triturate the dry substances into a very fine powder; then, having added the syrup, rub them again; and, adding the oil of caraway, mix them together."

Electuarium Scammoniæ. Electuary of Scammony. Dub.

"Take of Scammony, Ginger-Root, of each reduced to powder, an ounce; Oil of Cloves, a scruple; Syrup of Orange, as much as is suffi-

cient. Mix the ginger, rubbed to powder, with the syrup; then add the scammony, and, lastly, the oil."

This is a stimulating cathartic, not very frequently employed. Its dose is from half a drachm to a drachm.

CHAP. XXVII

PILULÆ.—PILLS.

Pills are formed from a mass sufficiently stiff and adhesive to preserve the round form which is given to them. Under this form, such medicines are generally exhibited as are nauseous, either in taste or flavour, and such as operate in a small dose. Few general rules require to be given with regard to their formation. Such of the ingredients as are capable of being reduced to powder, are triturated to the requisite fineness; those which are of a softer consistence are then added, and if this is not sufficient to bring the whole to a proper consistence, a small quantity of syrup or mucilage is to be added; the former is preferable, as the latter, in drying, is liable to render the mass too hard. Some substances, as several of the gum-resins, become soft on beating, so as to form into pills. Light vegetable powders, when beat up with syrup, form a mass which is not sufficiently coherent to roll out. In this case it is necessary to add a little pure soap, which gives the necessary tenacity. Metallic preparations, which are heavy, and given in a small dose, are made into pills by the addition of some extract or conserve. If the pill mass is too soft, so that the pills, after being formed, do not keep their form, it may be made harder by the addition of a small quantity of any inactive vegetable matter, as powder of liquorice. After they are rolled out, they must, to prevent them from adhering, be covered with the same powder, or, what is preferable, as less liable to become mouldy, starch or carbonate of magnesia. A pill ought not to exceed five grains in weight, or twelve may be formed from a drachm of the mass. They ought not to be prepared in too large a quantity at a time, as, if long kept, they become so hard as to be scarcely acted on in the stomach.

Pilulæ Aloeticæ. Aloetic Pills. Ed.

"Take of Socotorine Aloes reduced to powder, Hard Soap, of each equal weights. Beat them with a Simple Syrup, so as to make a mass fit for pills."

In this formula extract of gentian was formerly employed, but it rendered the mass too soft to form properly into pills. It affords a convenient form for the exhibition of aloes, and is in common use as a purgative. Its medium dose is 10 or 15 grains.

Pilulæ Aloes Compositæ. Compound Aloes Pills. Lond.

"Take of Socotorine Aloes, in powder, one ounce; Extract of Gentian, half an ounce; Oil of Caraway, forty minims; Simple Syrup, as much as necessary. Beat them together until they form a mass."

Under either of these simple forms aloes is commonly exhibited as a cathartic. Two pills are a medium dose.

PILULÆ ALOES CUM ZINGIBERE. Pills of Aloes with Ginger. Dub.

"Take of Hepatic Aloes, one ounce; Ginger Root in powder, one drachm; Spanish Soap, half an ounce; Essential Oil of Peppermint, half a drachm. Triturate the aloes with the ginger to powder; add the soap and essential oil, and form the whole into one mass."

This composition is adapted to the same purposes as the preceding pills, the essential oil adding aromatic flavour and pungency. Their dose is the same.

PILULÆ ALOES ET ASSAFŒTIDÆ. Pills of Aloes and Assafœtida. Ed.

"Take of Socotorine Aloes in powder, Assafœtida, Hard Soap, of each equal parts. Beat them into a mass with mucilage of gum-arabic."

These pills are occasionally employed in amenorrhœa, hysteria, in dyspepsia attended with flatulence, and in tympanitis, two or three being taken at bed-time. They prove useful by obviating costiveness.

PILULÆ ALOES ET MYRRHÆ. Pills of Aloes and Myrrh. Ed.

"Take of Socotorine Aloes, four parts: Myrrh, two parts; Saffron, one part. Beat them into a mass with Simple Syrup."

PILULÆ ALOES CUM MYRRHA. Pills of Aloes and Myrrh. Lond.

"Take of Socotorine Aloes, two ounces; Saffron, Myrrh, of each an ounce: Simple Syrup, a sufficient quantity. Rub the aloes and Myrrh separately into powder, then beat the whole together, until they form a mass."

PILULÆ ALOES CUM MYRRHA. Pills of Aloes and Myrrh. Dub.

"Take of Hepatic Aloes, an ounce; Myrrh, half an ounce; Saffron, two drachms; Essential Oil of Caraway, half a drachm; Syrup, a sufficient quantity. Rub the Aloes and myrrh separately to powder; then beat the whole into a mass."

These pills, under the name of Rufus's Pills, have long been in use, as affording a moderately stimulating cathartic, useful in dyspepsia connected with costiveness; sometimes used also in hypochondriasis, hysteria, and in jaundice. Their dose is ten or fifteen grains.

PILULÆ AMMONIARETI CUPRI. Pills of Ammoniuret of Copper. Ed.

"Take of Ammoniuret of Copper, rubbed into fine powder, sixteen grains; Crumb of Bread, four scruples; Water of Subcarbonate of Ammonia, as much as may be sufficient. Beat them into a mass, which divide into thirty-two equal pills."

It is under this form that ammoniuret of copper is given in epilepsy and the other spasmodic diseases in which it has been employed. Half a grain of it is contained in each pill. One pill is given at first, night and morning, and the dose is gradually increased, as far as the stomach and general system will bear it, until a cure is obtained, or the remedy has received a fair trial.

PILULÆ ASSAFŒTIDÆ COMPOSITÆ. Compound Assafœtida Pills. Ed.

"Take of Assafœtida, Galbanum, Myrrh, of each eight parts; Rectified Oil of Amber, one part. Beat them into a Simple Syrup."

PILULÆ GALBANI COMPOSITÆ. Compound Pills of Galbanum. Lond.

"Take of Galbanum, an ounce; Myrrh, Sagapenum, of each one ounce and a half; Assafœtida, half an ounce; Simple Syrup, as much as may be sufficient. Beat them together, and form a mass."

Pilulæ Myrrhæ Compositæ. Compound Pills of Myrrh. Dub.

"Take of Assafœtida, Myrrh in powder, Galbanum, of each an ounce; Oil of Amber, half a drachm. Triturate them together, and form them into a mass with Simple Syrup."

These compositions, though under different names, are similar. They all form a substitute for the Gum Pills of the older Pharmacopœias, and afford a stimulating aperient and antispasmodic used in hysteria and amenorrhœa; two or three of them being taken occasionally at bed-time. They sometimes prove useful too, in a similar dose, in chronic catarrh, by checking the increased secretion from the mucous glands of the lungs.

Pilulæ Colocynthidis Compositæ. Compound Colocynth Pills. Ed.

"Take of Socotorine Aloes, Scammony, of each eight parts; Colocynth, four parts; Sulphate of Potash, Oil of Cloves, of each one part. Let the aloes and scammony be reduced, with the salt, to powder; then let the colocynth, rubbed into a fine powder, and the oil, be added. Lastly, beat them with mucilage of gum-arabic into a mass."

Pilulæ Colocynthidis Compositæ. Compound Colocynth Pills. Dub.

"Take of Colocynth, half an ounce; Hepatic Aloes, Scammony of each an ounce; Spanish Soap, two drachms: Oil of Cloves, one drachm. Reduce the aloes, scammony, and colocynth, separately to powder, then beat them together with the oil and soap, and with syrup form them into a mass."

The compositions are of similar powers. They afford a stronger cathartic than the simple aloetic pill; and accordingly this compound pill is used in constipation, to obviate habitual costiveness. Two pills are a dose.

Pilulæ Gambogiæ Compositæ. Compound Gamboge Pills. Ed.

"Take of Gamboge in powder, Socotorine Aloes in powder, Aromatic Powder, of each one part; Hard Soap, two parts. Mix the powders; then, having added the soap, beat them into a mass with simple syrup."

Pilulæ Gambogiæ Compositæ. Compound Gamboge Pills. Lond.

"Take of Gamboge in powder, Socotorine Aloes in powder, Compound Powder of Cinnamon, of each one drachm; Soap, two drachms. Mix the powders together; then, adding the soap, beat the whole into one mass."

By the addition of the gamboge to the aloes, its cathartic power is increased, and a composition afforded more active than the aloetic pill. Two or three pills are a dose.

Pilulæ Hydrargyri. Mercurial Pills. Ed.

"Take of Purified Quicksilver, Conserve of Red Rose, of each one ounce; Starch, two ounces; Mucilage of Gum-Arabic, as much as may be necessary. Rub the quicksilver with the conserve, in a glass mortar, until the globules entirely disappear, adding, as there may be occasion, a little of the mucilage of gum-arabic; then add the starch, and beat with a little water, into a mass, which is to be immediately divided into four hundred and eighty pills."

Pilulæ Hydrargyri. Pills of Quicksilver. Lond.

"Take of Purified Quicksilver, two drachms; Conserve of Red Rose, three drachms; Liquorice Root in powder, one drachm. Rub the quicksilver with the conserve until the globules no longer appear, then adding the liquorice powder, beat the whole together so as to form a mass."

Pilulæ Hydrargyri. Pills of Quicksilver. Dub.

"Take of Purified Quicksilver, two drachms; Conserve of Rose, three drachms; Liquorice in fine powder, one drachm. Rub the quicksilver with the conserve until the globules entirely disappear; then adding the powder of liquorice, mix the whole together."

The trituration of the quicksilver in this preparation was formerly supposed to reduce it merely to a state of extreme mechanical division. But there is every reason to believe that an oxidation of the metal is effected, and that the medicinal efficacy of the preparation depends on this oxide. Quicksilver, in its metallic state, being inert with regard to the living system, the activity of the preparation itself is a presumption of this; but it is farther known, that by agitation with atmospheric air, quicksilver affords a portion of a grey powder, soluble in muriatic acid, and which must therefore be an oxide, metallic quicksilver being insoluble in that acid. This oxidation must be effected more readily when the surface of the metal is extended, and its continuity is divided by the interposition of any viscous matter, and hence the advantage derived from the trituration of it with substances of this kind, in the preparation of the mercurial pill. Different substances have been employed, syrup, mucilage, honey, and others. The Colleges have now agreed in preferring the Conserve of Rose, it having been supposed that this is superior to the others in facilitating the operation. Much attention is requisite that the trituration be continued until the extinction is completed, as on this the efficacy of the pill depends. This is known by rendering the matter a little thinner by the addition of water, and extending it by rubbing on a glass plate or paper, when the globules, if any remain, will be apparent. Starch has been selected by the Edinburgh College to form it into a mass, and is preferable to liquorice powder, as not being liable to become mouldy. A grain of mercury is contained in each pill, weighing four grains, prepared according to the formula of the Edinburgh Pharmacopœia; the same quantity is contained in three grains of the others.

This pill is the preparation of mercury that is upon the whole most generally used for obtaining the general action of this metal on the system; and while it is milder in its operation than some other mercurials, and has less determination to the intestinal canal, it is sufficiently active and certain. The common dose, given with the view of inducing the usual mercurial action, is two pills at bed-time and one in the morning, which, in particular cases and habits, requires to be increased. Four or six pills given at once generally excite purging.

Pilulæ Opiatæ, *olim Pilulæ Thebaicæ*. Opiate Pills. Ed.

"Take of Opium, one part; Extract of Liquorice, seven parts; Jamaica Pepper, two parts. Beat the opium and the extract into a pulp; then add the Jamaica pepper rubbed to powder, and, beating them well, reduce them to a mass."

Pilulæ Saponis cum Opio. Pills of Soap with Opium. Lond.

"Take of Hard Opium, rubbed to powder, half an ounce; Hard Soap, two ounces. Beat them together until they form one mass."

Pilulæ Styrace. Pills of Storax. Dub.

"Take of Purified Storax, three drachms; Soft Purified Opium, one drachm; Saffron, the same weight. Beat them together, mixing them thoroughly."

The articles which in these compositions are added to the opium, have no important effect on its operation; they serve merely to disguise it; and where it is necessary, which it occasionally is, to conceal the administration of opium from the patient, they afford convenient forms. Even the name sometimes requires to be concealed in a prescription; and hence the reason of the names given by the London and Dublin Colleges being derived from the trivial ingredients. It is only to be regretted, that the proportion of opium is not the same in all of them. Two pills, or ten grains of the pill of the Edinburgh Pharmacopœia, contain one grain of opium; while in the formula of the London and Dublin College, the proportion is larger, five grains or one pill containing one grain.

Pilulæ Rhei Compositæ. Compound Pills of Rhubarb. Ed.
"Take of the Root of Rhubarb, in powder, one ounce; Socotorine Aloes, six drachms. Myrrh, half an ounce; Volatile Oil of Peppermint, half a drachm. Beat them into a mass with syrup of orange-peel."

This is a moderate laxative much employed, especially in dyspeptic affections, to obviate costiveness, and stimulate gently the stomach and intestines; hence known by the name of Stomachic Pills. Two pills are taken at bed-time; they operate in general without occasioning any irritation, and evacuate the contents of the intestines without inducing purging.

Pilulæ Scilliticæ. Squill Pills. Ed.
"Take of the dried Root of Squill, rubbed to a fine powder, one scruple; Gum Ammoniac, Cardamom Seeds in powder, Extract of Liquorice, of each one drachm. Beat them with simple syrup into a mass."

Pilulæ Scillæ Compositæ. Compound Squill Pills. Lond.
"Take of the Root of Squill recently dried, and beat to powder, a drachm; Ginger Root, in powder, Hard Soap, of each three drachms; Gum Ammoniac, in powder, two drachms. Mix the powders; then beat them with the soap, and add as much syrup as may be sufficient to give the due consistence."

Pilulæ Scillæ cum Zingibere. Pills of Squill with Ginger. Dub.
"Take of Squill Root in powder, one drachm; Ginger Root in powder, two drachms; Essential Oil of Anise, ten drops. Triturate them together, and form them into a mass by the addition of soap jelly."

Under the form of these compositions, which have long been officinal, and which do not differ materially from each other, squill is given as an expectorant in dyspnœa and chronic catarrh, two pills being taken morning and evening. Any efficacy they have depends on the squill. But there appears to be no advantage in reducing so much its activity by the addition of so large a proportion of other matter; and as squill, when long kept, is liable to have its strength impaired, it is perhaps preferable that it should be given under some form of extemporaneous preparation.

Pilulæ Subcarbonatis Sodæ. Pills of Subcarbonate of Soda. Ed.
"Take of Subcarbonate of Soda, four parts; Hard Soap, three parts. Beat into a mass with simple syrup."

This form of exhibiting soda was first recommended by Dr. Beddoes, and appears to be a very convenient preparation for exhibiting that substance.

Pilulæ Submuriatis Hydrargyri Compositæ. Compound Pills of Submuriate of Mercury. Ed.

"Take of Submuriate of Mercury, Sulphuret of Antimony precipitated, of each one part; Guaiac in powder, two parts. Rub the submuriate with the sulphuret, and then with the gum-resin, and finally beat into a mass with the mucilage of gum arabic."

Pilulæ Hydrargyri Submuriatis Compositæ. Compound Pills of Submuriate of Quicksilver. Lond.

"Take of Submuriate of Quicksilver, Precipitated Sulphuret of Antimony, of each a drachm; Gum-Resin of Guaiac beat to powder, two drachms. Triturate the submuriate of quicksilver with the precipitated sulphuret of antimony, then with the gum-resin of guaiac, and add of mucilage of gum-arabic as much as may be sufficient to give the proper consistence."

This, under the name of Plummer's Pill, has been used as an alterative in cutaneous diseases, in a dose of ten grains.

Pilulæ Sulphatis Ferri Compositæ. Compound Pills of the Sulphate of Iron. Ed.

"Take of Sulphate of Iron in powder, one ounce; Extract of Chamomile, one ounce and a half; Volatile Oil of Peppermint, a drachm. Beat them into a mass with simple syrup."

This affords a very good chalybeate, and may be given in those cases where steel is indicated.

Pilulæ Ferri Compositæ. Compound Pills of Iron. Lond.

"Take of Myrrh beat to powder, two drachms; Subcarbonate of Soda. Sulphate of Iron, Sugar, of each a drachm. Triturate the myrrh with the subcarbonate of soda; then having added the sulphate of iron, triturate them again; lastly, beat the whole together, until they form an uniform mass."

This is the same composition, with regard to the active ingredients, as forms the basis of the Compound Mixture of Iron, already noticed; and it may be occasionally convenient to prescribe it under the form of pill, or to form the mixture from it extemporaneously by diffusion in water.

CHAP. XXVIII.

TROCHISCI.—TROCHES.

Troches, or Lozenges, consist of powders mixed with mucilage, in such a proportion, that when dried they are firm and hard. While in the state of a soft paste, they are cut into small square or round tablets, and these are hardened by drying. The form is one adapted principally to such medicines as are designed to dissolve slowly in the mouth; and hence they are rendered pleasant by the addition of a large proportion of sugar. They are seldom active remedies, but are employed principally in affections of the mouth or throat. As of little importance, they have been re-

jected in the Dublin and in the late edition of the London Pharmacopœia, and a few only are retained by the Edinburgh College.

Trochisci Carbonatis Calcis. Troches of Carbonate of Lime. Ed.

"Take of Prepared Carbonate of Lime, four ounces; Gum Arabic, one ounce; Nutmeg, one drachm; Refined Sugar, six ounces. Rub these to powder, and make them into a mass with water, fit for forming troches."

This is a pleasant form under which carbonate of lime may be given as an antacid, though the quantity of saccharine matter may perhaps favour the production of acid in the stomach; and either from this, or from not being well prepared in the shops, they are little used.

Trochisci Carbonatis Magnesiæ. Carbonate of Magnesia Troches. Ed.

"Take of Carbonate of Magnesia, six ounces; Refined Sugar, three ounces; Nutmeg, a scruple. Reduce to powder, and form into troches with the mucilage of gum tragacanth."

These lozenges are used to correct acidity in the stomach.

Trochisci Glycyrrhizæ Glabræ. Liquorice Troches. Ed.

"Take of Extract of Liquorice, Gum Arabic, of each one part; Refined Sugar, two parts; Boiling Water, as much as may be necessary. Dissolve in the water, and strain. Then evaporate the solution with a gentle heat into a mass, which form into troches."

These, from their demulcent quality, may be used to allay coughing in catarrh; but the extract of liquorice is equally effectual, and when purified by solution in water and inspissation, so as to be of a firm consistence, forming what is named Refined Liquorice, is more grateful.

Trochisci Glycyrrhizæ cum Opio. Liquorice Troches with Opium. Ed.

"Take of Opium, two drachms; Tincture of Tolu Balsam, half an ounce; Simple Syrup, eight ounces; Extract of Liquorice softened with warm water, Gum Arabic in powder, of each five ounces. First rub the opium thoroughly with the tincture; then add gradually the syrup and the extract; afterwards sprinkle in the powder of gum arabic; and lastly, dry the mass, that it may be formed into troches, each weighing ten grains."

These are the most active troches in the Pharmacopœia, and are effectual in relieving the tickling cough attending catarrh. The opium is the ingredient on which their efficacy principally depends, its local operation lessening the irritation which gives rise to coughing; the others cover its taste and flavour, and add a demulcent quality. One drachm, or six troches, contain one grain of opium; and from six to twelve may be taken in twenty-four hours. The composition would be improved, if the proportion of opium were diminished, as they would be less ungrateful, their action would be more gradual, and a greater number could be taken. A substitute might be found too for the balsam of Tolu, the flavour of which is unpleasant, and which cannot communicate any virtue.

Trochisci Gummosi. Gum Troches. Ed.

"Take of Gum Arabic, four parts; Starch, one part; Refined Sugar, twelve parts. These being rubbed to powder, are to be formed into a mass with rose water, fit for forming troches."

This composition is designed as a demulcent, but is never used; it is not very pleasant, and gum arabic, when pure, answers the same purpose.

TROCHISCI NITRATIS POTASSÆ. Troches of Nitrate of Potash. Ed.

"Take of Nitrate of Potash, one part; Refined Sugar, three parts. Beat them to powder, and, with mucilage of gum tragacanth, make them into a mass proper for forming troches."

Under this form nitrate of potash is used as a refrigerant in angina tonsillaris, and to allay the sense of heat attending salivation, and abate the inflammation, being allowed to dissolve slowly in the mouth. They do not retain their form, being liable to become humid, and a mixture of nitre and sugar in powder answers equally well.

CHAP. XXIX.

OLEOSA.—OILY PREPARATIONS.

THE preparations included in this chapter, are combinations of expressed oils with more active substances, principally designed for external application, the oil moderating their action, or communicating a convenient form.

OLEUM AMMONIATUM. Ammoniated Oil. Ed. LINIMENTUM AMMONIÆ. Liniment of Ammonia. Dub.

"Take of Olive Oil, eight parts; Water of Ammonia, one part. Mix them."

LINIMENTUM AMMONIÆ FORTIUS. Stronger Liniment of Ammonia. Lond.

"Take of Liquor of Ammonia, an ounce; Olive Oil, two fluidounces. Shake them together until they unite."

LINIMENTUM AMMONIÆ SUBCARBONATIS. Liniment of Subcarbonate of Ammonia. Lond.

"Take of Liquor of Subcarbonate of Ammonia, a fluidounce; Olive Oil, three fluidounces. Shake them together until they unite."

In these compositions, the alkali combines with the expressed oil, forming a thick white saponaceous compound, in the last the combination with the alkaline carbonate is imperfect. They are all used as rubefacients, and are convenient for application; a piece of flannel moistened with any of them being applied to the part, or sometimes friction being made with the liniment for a short time. From the former mode of application, the rubefacient operation is sufficiently obtained; it is a remedy often employed in cynanche tonsillaris, as less severe than a blister. The composition of the Edinburgh College seems on the whole best adapted to general use, as of medium strength, and, if necessary, it is easy to render it a little more active.

OLEUM CAMPHORATUM. Camphorated Oil. Ed. (Linimentum Camphoræ. Lond.—Ol. Camph. Dub.)

"Take of Olive Oil, two ounces; Camphor, half an ounce. Mix them, so that the camphor may be dissolved."

This is a form under which camphor is frequently applied externally as a stimulant and anodyne in rheumatism and other similar affections, and is the most convenient one, when it is to be applied by friction. It is sometimes rendered more active by the addition of a little ammonia.

Oleum Lini cum Calce, *sive Linimentum Aqua Calcis.* Liniment of Lime Water. Ed.

"Take of Oil of Lintseed, Solution of Lime, of each equal parts. Mix them."

Linimentum Calcis. Liniment of Lime. Dub.

"Take of Lime Water, Olive Oil, of each three ounces. Mix by agitation."

This is a saponaceous compound, formed by the mutual chemical action of the lime water and oil. It is a thick bland fluid of a white colour, and is sometimes used as a soothing application to inflamed parts, more particularly to burns, being spread over the surface with a feather. It requires to be extemporaneously prepared, as after a little time the soapy matter separates from the water.

CHAP. XXX.

LINIMENTA, UNGUENTA, ET CERATA.—LINIMENTS, OINTMENTS, AND CERATES.

These are compositions of a soft consistence, having some unctuous substance for their basis, such as oil, lard, spermaceti or wax. When the consistence is so soft as to be thick, but nearly fluid, it is termed a Liniment; when it is more firm, it is an Ointment; and when still harder, forms a Cerate. These degrees of consistence depend on the proportions of the ingredients. Where the oil is in large quantity, a liniment is formed, and the addition to this of a large proportion of wax forms an ointment or cerate.

Formerly ointments were numerous and complicated in their composition, and surgeons adapted, with much formality, different ointments to different indications. The practice is now more simple; the principal intention in these applications is to keep the part soft and easy, and to exclude the atmospheric air, and therefore the simplest composition that is of a proper consistence and tenacity answers the purpose. It is only in a few cases that substances are added with the view of obtaining peculiar effects from their stimulant, or sometimes their specific operation, or from their chemical action. The consistence of a cerate is usually the most convenient for continued application, that of an ointment being rather too thin, especially as it is rendered thinner by the heat of the part applied.

Linimentum Simplex. Simple Liniment. Ed.

"Take of Olive Oil, four parts; White Wax, one part. Melt the wax by a gentle heat in the oil, and then shake the mixture continually till it hardens. The same is done with the ointment and cerate."

Unguentum Simplex. Simple Ointment. Ed.

"Take of Olive Oil, five parts; White Wax, two parts."

CERATUM SIMPLEX. Simple Cerate. Ed.

"Take of Olive Oil, six parts: White Wax, three parts; Spermaceti, one part."

These compositions differ merely in consistence. They are applied, spread on linen, as usual dressings to slight wounds and excoriations. The cerate affords the composition, which, from consistence, is best adapted to this. The following compositions, in the London and Dublin Pharmacopœias, are nearly the same, and are designed for the same purposes.

UNGUENTUM CETACEI. Spermaceti Ointment. Lond.

"Take of Spermaceti, six drachms; White wax, two drachms; Olive Oil, three fluidounces. Having melted them with a gentle fire, stir them constantly until they cool."

UNGUENTUM SPERMATIS CETI. Ointment of Spermaceti. Dub.

"Take of White Wax, half a pound; Spermaceti, one pound; Prepared Lard, three pounds. Form an ointment."

CERATUM CETACEI. Spermaceti Cerate. Lond.

"Take of Spermaceti, half an ounce; White wax, two ounces: Olive Oil, four fluidounces. To the spermaceti and wax melted, add the oil, and stir them until they cool."

CERATUM SIMPLEX. Simple Cerate. Lond.

"Take of Olive Oil, four fluidounces: of Yellow Wax, four ounces. Add the oil to the wax melted, and mix."

UNGUENTUM CERÆ FLAVÆ. Ointment of Yellow Wax. Dub.

"Take of Purified Yellow Wax, a pound; of Prepared Lard, four pounds. Form an ointment."

UNGUENTUM RESINOSUM. Resinous Ointment. Ed.

"Take of Hogs' Lard, eight parts; White Resin, five parts; Yellow Wax, two parts. Melt them all by a gentle heat, and shake the mixture until it becomes cold and hardens."

CERATUM RESINÆ. Cerate of Resin. Lond.

"Take of Yellow Resin, Yellow Wax, each a pound; Olive Oil, a pint. Melt the wax and resin with a slow fire, then add the oil, and strain the cerate through linen while warm."

UNGUENTUM RESINÆ ALBÆ. Ointment of White Resin. Dub.

"Take of Yellow Wax, a pound; White Resin, two pounds; Prepared Lard, four pounds. Form an ointment, which, while hot, strain through a sieve."

The addition of the resin renders this more stimulating than the preceding ointments. Hence it is used as a dressing where the object is to promote suppuration.

UNGUENTUM PULVERIS CANTHARIDIS VESICATORIÆ. Ointment of Powder of Cantharides. Ed.

"Take of Resinous Ointment, seven parts; Powder of Cantharides, one part. Throw the powder over the ointment when it is melted, and shake till it becomes hard."

CERATUM LYTTÆ. Cerate or Cantharides. Lond.

"Take of Spermaceti Cerate, six drachms; Cantharides rubbed to a very fine powder, a drachm. To the cerate, softened by heat, add the cantharides, and mix."

UNGUENTUM CANTHARIDIS. Ointment of Cantharides. Dub.

"Take of Ointment of Yellow Wax, half a pound; Cantharides in powder, an ounce. Form an ointment."

This is the ointment commonly employed to establish a purulent discharge, or form a superficial issue in the part to which a blister has been applied: this it does from the acrid and stimulating quality of the cantharides, which changes the serous discharge from the blister into one of a purulent nature, and by continuing the application, this may be kept up for any length of time. In preparing it, the cantharides ought to be reduced to a very fine powder.

UNGUENTUM INFUSI CANTHARIDIS VESICATORIÆ. Ointment of Infusion of Cantharides. Ed.

"Take of Cantharides, White Resin, Yellow Wax, of each one part; Venice Turpentine, Hogs' Lard, of each two parts; Boiling Water, four parts. Macerate the cantharides in the water for a night, and strain the liquor, pressing it strongly: having added the lard, boil it until the water is evaporated; then add the wax and resin. These being melted and removed from the fire, add the turpentine, and mix thoroughly."

UNGUENTUM LYTTÆ. Ointment of Cantharides. Lond.

"Take of Cantharides, rubbed to a very fine powder, two ounces; Distilled Water, eight fluidounces; Resinous Cerate, eight ounces. Boil the water with the cantharides to one half, and strain. Mix the cerate with the strained liquor, and evaporate to the proper consistence."

The ointment with the powder of cantharides sometimes occasions pain and irritation. The composition obtained by this process is designed as a milder application, adapted in such cases to answer the same indication. The water, by infusion on the cantharides, extracts the acrid matter; but this, from being in a state of solution, is, after the subsequent evaporation, diffused through the unctuous matter in a state of finer division than the powder can be: it is also, from the proportions ordered, in smaller quantity, but its stimulating quality is aided by the turpentine, and it is sufficient to keep up the purulent discharge.

CERATUM JUNIPERI SABINÆ Cerate of Savine. Ed.

"Take of Fresh Savine Leaves bruised, two parts; Yellow Wax, one part; Prepared Hogs' Lard, four parts. Melt the wax and lard together; boil the savine leaves with them, and then express through a linen cloth."

CERATUM SABINÆ. Cerate of Savine. Lond.

"Take of the Fresh Leaves of Savine bruised, one pound; Yellow Wax, half a pound; Prepared Lard, two pounds. Boil the leaves of the savine with the lard and wax melted together; then strain through linen."

UNGUENTUM SABINÆ. Ointment of Savine. Dub.

"Take of the Fresh Leaves of Savine plucked from the stalks, and bruised, half a pound; Prepared Lard, two pounds; Yellow Wax, half a pound. Boil the leaves with the lard until these become crisp, then strain with expression. Lastly, add the wax, and melt them together."

This ointment is designed as a substitute for the cantharides ointment, as an application to excite suppuration, and keep up a purulent discharge, which it is said to do without producing pain or irritation,—consequences that occasionally result from the common issue ointment. I is also sometimes used prepared from the leaves of savine, reduced to fine powder, and mixed with lard.

UNGUENTUM GALLÆ. Ointment of Galls. Ed.

"Take of Galls in powder, one part; Hogs' Lard, eight parts. Mix them thoroughly."

This is frequently employed in forming pills.

UNGUENTUM PICIS LIQUIDÆ. Ointment of Tar. Ed.

"Take of Tar, five parts; Yellow Wax, two parts. Melt the wax with a gentle heat, then add the tar, and continue shaking the mixture until it becomes cold and hard."

UNGUENTUM PICIS LIQUIDÆ. Ointment of Tar. Lond.

"Take of Tar, Prepared Tallow, each a pound. Melt them together, and strain them through linen."

UNGUENTUM PICIS LIQUIDÆ. Ointment of Tar. Dub.

"Take of Tar, Tallow, each half a pound. Strain them, melted together, through a sieve."

This stimulating ointment is sometimes applied to foul ulcers, and has been used with advantage in tinea capitis.

UNGUENTUM RESINÆ NIGRÆ. Pitch Ointment. Lond.

"Take of Pitch, Yellow Wax, Yellow Resin, of each nine ounces; Olive Oil, a pint. Melt them together, and strain through linen."

This is applied to the same purpose as the preceding ointment, from which it differs a little in consistence, and its smell being less strong.

UNGUENTUM ACIDI NITROSI. Ointment of Nitrous Acid. Ed.

"Take of Hogs' Lard, one pound; Nitrous Acid, six drachms. Mix the acid gradually with the melted lard, and beat the mixture thoroughly while it cools.

UNGUENTUM ACIDI NITROSI. Ointment of Nitrous Acid. Dub.

"Take of Olive Oil, a pound; Prepared Lard, four ounces; Nitrous Acid, an ounce. Add the acid to the oil and the fat melted together in a glass vessel. Apply a moderate heat in a water-bath for a quarter of an hour; then removing from the bath, stir constantly with a glass rod, until they become cold."

In this preparation part of the acid is decomposed, and part of it is combined with the lard. It is designed as an application in cutaneous affections, and has been said to be similar in its effects to the preceding ointment. It appears, however, considerably inferior in efficacy, and since its first introduction it has been little used.

UNGUENTUM SUBACETATIS CUPRI, *olim Unguentum Æruginis*. Ointment of Subacetate of Copper. Ed.

"Take of Resinous Ointment, fifteen parts; Subacetate of Copper, reduced to a very fine powder, one part. Sprinkle the subacetate on the melted ointment, and then shake the mixture continually until it hardens."

UNGUENTUM ÆRUGINIS. Ointment of Verdigrease. Dub.

"Take of Resinous Ointment, a pound; Prepared Verdigrease, half an ounce. Form an ointment."

This ointment is used as a stimulant, and escharotic, applied to foul ulcers. It is rather too active, and in general requires to be mixed with a proportion of resinous or simple ointment; nor is it used but as an occasional dressing.

Unguentum Hydrargyri. Ointment of Quicksilver. Ed.

"Take of Purified Quicksilver, Mutton Suet, of each one part; Hogs' Lard, three parts. Rub the quicksilver thoroughly in a mortar with a little of the lard, until the globules disappear; then add the remaining fats. It may be made also with a double or triple proportion of quicksilver."

Unguentum Hydrargyri Fortius. Stronger Ointment of Quicksilver. Lond.

"Take of Purified Quicksilver, two pounds; Prepared Hogs' Lard, twenty-three ounces: Prepared Tallow, one ounce. Rub first the quicksilver with the tallow and a little lard, until the globules disappear; then add the remaining lard, and mix them."

Unguentum Hydrargyri. Ointment of Quicksilver. Dub.

"Take of Purified Quicksilver, Prepared Lard, equal weights. Rub them together in a marble or iron mortar, until the globules of quicksilver disappear.

Unguentum Hydrargyri Mitius. Milder Ointment of Quicksilver. Lond.

"Take of the Stronger Ointment of Quicksilver, one pound; Prepared Hogs' Lard, two pounds. Mix them."

Unguentum Hydrargyri Mitius. Milder Ointment of Quicksilver. Dub.

"This is made with double the weight of Lard."

Of these ointments, the one always employed for mercurial friction is that from equal weights of quicksilver and lard. The only use of the lard is to facilitate the extinction, as it is called, of the quicksilver, and the introduction of it through the cuticle: these purposes are attained from this proportion, and any larger quantity of unctuous matter merely renders it necessary to continue the friction longer. For application in some cutaneous affections, the milder ointment is sometimes used. The proportion of one part of quicksilver to four of unctuous matter, ordered in the Edinburgh Pharmacopœia, gives an ointment weaker than any that is used or kept in the shops; and it would be preferable, therefore, to order the preparation as in the other Pharmacopœias.

This, like other mercurial preparations obtained by trituration, was at one time regarded as deriving its efficacy from the mere mechanical division of the metal. The reasons have been already stated for believing, that in all these preparations the mercury is oxidated, and that their action on the living system depends on this oxide. There are even additional grounds for admitting this conclusion with regard to mercurial ointment. Unctuous matter appears in general to promote the oxidation of metals by the action of the air, as is exemplied in the green crust which copper speedily acquires when coated thinly with grease; quicksilver being in the fluid state, and the surface being extended and renewed by the trituration, these circumstances are still more favourable to the same change. The improvement of the ointment from keeping, affords a similar presumptive proof. When newly prepared, it is of a light bluish-grey colour, but when kept for some time it becomes of a much darker colour, probably from the oxidation of the metal becoming more complete; and it has accordingly been found, that from fresh ointment, more metallic quicksilver subsides, when it is kept liquid by the heat of a water-bath, than from ointment long prepared. Even from the latter, only part of the quicksil-

ver subsides in globules, the remaining quantity is in the state of a grey powder, which there is reason to conclude is the oxide of the metal.

It has been supposed, that the quicksilver in the preparation may suffer a farther change. Unctuous matter, more especially that of animal origin, becomes rancid from the action of the air, and this rancidity appears to be connected with the formation of an acid, probably the acid produced from fat, the Sebacic. This change may take place to a certain extent during the trituration, and still more when the ointment is kept, and may promote the oxidation of the mercury, while any acid that is formed may combine with the oxide. According to this view, mercurial ointment will consist of unctuous matter, in which is diffused oxide and sebate of mercury, with a portion generally of metallic mercury, in activity, of course, depending on the former.

The extinction of the mercurial globules by trituration being a laborious process, several expedients have been contrived to facilitate it. Several of these are inadmissible, such as the use of sulphur or turpentine. In the ointment prepared with the former, the mercury is probably not in an active state ; it is known by its black colour, and by the smell of sulphur exhaled when paper covered with it is kindled. Turpentine renders the ointment too acrid, so that when rubbed on the skin it produces irritation or inflammation ; it also can be detected by the odour exhaled in burning. Rancid fat extinguishes the quicksilver better than recent fat, and may be allowed, as by the action of the metal the rancidity of the fat appears to be corrected.* The trituration should be made at first with a little tallow,

* "Another mode that has been recommended is, the addition of prepared ointment, in the proportion of one part of ointment to three parts of quicksilver. These, by being briskly rubbed together in a proper sized mortar, form a speedy union, so as greatly to abridge the labour which is required where the ordinary method is pursued. But among the various methods of manipulation which have been proposed with a view of abridging the labour of making mercurial ointment, without deteriorating the preparation, none, say the editors of the London Medical Repository in one of their late volumes, have held forth such high expectations, as the use of *oil of eggs*, lately adopted on the continent of Europe. "When mercury is triturated with oil of eggs which has been kept for some months, although it have no disagreeable odour, the metal in a few minutes spreads over the sides of the mortar in a thin layes, resembling the amalgam on a looking-glass : in a few minutes longer all the globules disappear, and after adding the lard and suet, the whole operation, which would require the labour of several days by the usual method, is completed in an hour." A drachm or a drachm and a half of the oil is reckoned sufficient to extinguish eight ounces of mercury, the quantity requisite for making sixteen ounces of ointment. The following is the *formula* recommended by M. Planche in the *Journal de Pharmacie*, for 1815 :—Take of oil of eggs, which has been kept for three months in a temperature of from 15 to 16° Reaumur, in a bottle only half filled and corked, ... ʒiss.

Purified mercury, ...	℥viij.
Prepared lard, ...	℥vij.
Fresh beef suet, ...	℥i.

Melt the suet and the lard together, and allow the mixture to cool. Rub the mercury with the oil in a marble mortar with a wooden pestle, until the globules no longer reunite ; then add an ounce of the fatty mixture and continue the trituration until all the globules disappear ; after which, the remainder of the fat may be added. The operation requires an hour to complete it ; but the time may be reduced to half of that period, if double the quantity of oil of eggs be employed. For a new operation, it is useful to leave an ounce of the ointment in the mortar.

The oil of egg can be most readily procured by the following method :—"Let any quantity of the yolks of fresh eggs be put into a silver or glass vessel, and dried by the heat of a water-bath until the oil can be expressed from the mass in the hand. Put this into a cloth bag, and press it strongly between two plates of pewter, warmed in

as lard does not oppose sufficient resistance to afford all the assistance that may be derived from the interposed matter, in facilitating the mechanical division.

Mercurial ointment is the form under which mercury is introduced into the system by external friction. It is a mode employed with advantage in cases where mercurials administered internally are liable to be determined to the intestines, so as to occasion griping or purging, or when it is necessary to introduce a large quantity of mercury speedily into the system; the general mercurial action being thus soon induced. It is likewise employed in some local affections, particuarly bubo. One drachm of the strong ointment (that containing equal parts of mercury and lard) is introduced by friction on the skin in the evening, and frequently also in the morning, until the system is affected, the part on which the ointment is rubbed being occasionally changed to avoid irritation or inflammation. The weaker ointment is used only as a dressing to ulcers, or as a local application.

UNGUENTUM OXIDI HYDRARGYRI CINEREI. Ointment of Grey Oxide of Quicksilver. Ed.

"Take of Grey Oxide of Quicksilver, one part; Hogs' Lard, three parts. Mix them thoroughly."

This is designed as a substitute for the mercurial ointment; and, as the quicksilver is fully oxidated, it has been supposed that it will prove more active and certain. It probably would have this advantage; but it has been said, that it is not easily introduced by friction, the unctuous matter passing through the cuticle without the whole of the oxide,—a difference which, if it do exist, must depend on the combination being less intimate.

UNGUENTUM OXIDI HYDRARGYRI RUBRI. Ointment of Red Oxide of Quicksilver. Ed.

"Take of Red Oxide of Quicksilver by Nitric Acid, one part; Hogs' Lard, eight parts."

UMGUENTUM HYDRARGYRI NITRICO-OXYDI. Ointment of Nitric Oxide of Quicksilver. Lond.

"Take of Nitric Oxide of Quicksilver, an ounce; White Wax, two ounces; Prepared Lard, six ounces. To the wax and lard melted together, add the nitric oxide of quicksilver, rubbed into a very fine powder, and mix."

UNGUENTUM SUBNITRATIS HYDRARGYRI. Ointment of Subnitrate of Quicksilver. Dub.

"Take of Ointment of White Wax, half a pound: Subnitrate of Quicksilver, half an ounce. Form an ointment."

This is applied as a mild escharotic to remove the diseased surface of ulcers, and as a stimulant to promote suppuration; and in cases of languid ulceration and chronic inflammation is often used with marked benefit. In some forms of ophthalmia much advantage is derived from it particularly where the edges of the tarsi are raw or ulcerated, or where, from the continuance of inflammation, the vessels on the surface have become weaken-

boiling water. The oil thrown upon a filter, in a funnel heated by steam, will then pass through perfectly clear." The analysis of 100 parts of oil of eggs, according to M. Planche, yielded 91 parts of pure animal oil, and 9 of suet."—*Dyckman in Duncan's Edinburgh Dispensatory.*—Ed.

ed, and where specks are beginning to form on the cornea ; it is also useful in the scrofulous ophthalmia of children. Care ought to be taken in its preparation, that the powder is very fine ; it ought also to be prepared only when it is to be used, or at least ought not to be long kept, as the mercurial oxide or subnitrate undergoes decomposition, which is indicated by the colour changing from red to grey.

Unguentum Nitratis Hydrargyri Fortius, *vulgo Unguentum Citrinum.* Stronger Ointment of Nitrate of Quicksilver. Ed.

"Take of Purified Quicksilver, one part ; Nitrous Acid, two parts ; Olive Oil, nine parts ; Hogs' Lard, three parts. Dissolve the quicksilver in the acid ; then beat up the solution strongly with the lard and oil previously melted together, and beginning to cool, in a glass mortar, so as to form an ointment."

Unguentum Hydrargyri Nitratis. Ointment of Nitrate of Quicksilver. Lond.

"Take of Purified Quicksilver, an ounce ; Nitric Acid, eleven fluiddrachms ; Prepared Lard, six ounces ; Olive Oil, four fluidounces. Dissolve the quicksilver in the acid ; then mix the liquor, while still warm, with the fat and the oil melted together."

Unguentum Supernitratis Hydrargyri. Ointment of Supernitrate of Quicksilver. Dub.

"Take of Purified Quicksilver, an ounce ; Nitrous Acid, two ounces ; Olive Oil, a pint ; Prepared Lard, four ounces. Dissolve the quicksilver in the acid, mix in the oil and lard melted together, and form an ointment in the same manner as the nitrous acid ointment."

In this ointment the nitrate of quicksilver is combined with the lard ; and as there is an excess of nitric acid, it acts chemically on the fat, and notwithstanding the quantity of oil used, gives to the composition a firm consistence. It forms, like the preceding ointment, a very excellent application in various forms of chronic inflammation, such as psorophthalmia ; it is also used in different kinds of cutaneous eruption, herpetic, or connected with superficial inflammation or ulceration. It is either rubbed gently on the part affected, or where this would produce irritation, it is applied, softened by heat, by a hair pencil.

Unguentum Nitratis Hydrargyri Mitius. Milder Ointment of Nitrate of Quicksilver. Ed.

"This is made in the same manner as the preceding with a triple proportion of lard and oil"

This is designed to afford an application milder than the former, and of a softer consistence ; but, to obtain the latter convenience, it is better to reduce the strong ointment with the requisite proportion of lard, when it is to be used, as from the operation of the acid, the milder ointment, even with the increased proportion of unctuous matter, is nearly equally firm as the stronger ointment.

Unguentum Acetatis Plumbi. Ointment of Acetate of Lead. Ed.

"Take of Simple Ointment, twenty parts ; Acetate of Lead, in fine powder, one part. Mix thoroughly."

Ceratum Plumbi Superacetatis Cerate of Superacetate of Lead, Lond.

"Take of Superacetate of Lead in powder, two drachms ; White Wax, two ounces ; Olive Oil, half a pint. Melt the wax in seven fluidounces of

the oil; then add to them gradually the superacetate of lead, rubbed down with the rest of the oil, and stir with a wooden spatula until they unite."

UNGUENTUM ACETATIS PLUMBI. Ointment of Acetate of Lead. Dub.

"Take of Ointment of White Wax, a pound and a half; Acetate of Lead, an ounce. Form an ointment."

The preparations of lead have been supposed to possess a specific power in abating inflammation by local application. They are usually applied under the form of solution; but where that of ointment is preferred, this composition has been considered as preferable to any other, as containing the most active preparation of lead. It is accordingly often used as a dressing to inflamed parts.

UNGUENTUM CARBONATIS PLUMBI. Ointment of Carbonate of Lead. Ed.

"Take of Simple Ointment, five parts; Carbonate of Lead, in fine powder, one part."

UNGUENTUM CERUSSÆ, sive SUBACETATIS PLUMBI. Ointment of Cerusse, or Subacetate of Lead. Dub.

"Take of Ointment of White Wax, a pound; Cerusse, reduced to a very fine powder, two ounces. Form an ointment."

This has been used principally as an application to burns and superficial inflammation.

CERATUM PLUMBI COMPOSITUM. Compound Cerate. Lond.

"Take of Solution of Acetate of Lead, two fluidounces and a half; Yellow Wax, four ounces; Olive Oil, nine ounces; Camphor, half a drachm. Mix the wax melted, with eight fluidounces of the oil; then remove the mixture from the fire, and as soon as it begins to become thick, add gradually the solution of acetate of lead, and stir them constantly with a wooden spatula. Lastly, mix with these the camphor dissolved in the remaining oil."

A composition similar to this was introduced by Goulard, as a form of applying lead in ointment. It has been known by the name of Goulard's Cerate, and has been supposed preferable to the preceding ointment. It may derive some advantage as a soothing application to inflamed parts, from its soft consistence, and from the acetate of lead being diffused through it in a dissolved state.

CERATUM CARBONATIS ZINCI IMPURI. Cerate of Calamine. Ed.

"Take of Simple Cerate, five parts; Prepared Impure Carbonate of Zinc, one part. Mix them thoroughly."

CERATUM CALAMINÆ. Cerate of Calamine. Lond.

"Take of Prepared Calamine, Yellow Wax, each half a pound; Olive Oil, a pint. Mix the oil with the wax melted, then remove from the fire, and when they begin to thicken, add the Calamine, and stir constantly until they cool."

UNGUENTUM CALAMINARIS. Calamine Ointment. Dub.

"Take of Ointment of Yellow Wax, five pounds; Prepared Calamine, a pound. Form an ointment."

This is the common healing cerate, Turner's Cerate, as it has been named, which has long been used as a dressing in slight wounds, excoriations and ulcers. It acts by excluding the air and keeping the surface to

which it is applied soft; and is preferable to the composition of wax and oil alone, from the levigated calamine giving a degree of consistence, which is not altered by the heat of the body.

UNGUENTUM OXIDI ZINCI. Ointment of Oxide of Zinc. Ed.

"Take of Simple Liniment, six parts: Prepared Oxide of Zinc, one part. Mix thoroughly."

UNGUENTUM ZINCI. Ointment of Zinc. Lond.

"Take of Oxide of Zinc, an ounce; Prepared Lard, six ounces. Mix them."

UNGUENTUM OXYDI ZINCI. Ointment of Oxide of Zinc. Dub.

"Take of Ointment of White Wax, a pound; Oxide of Zinc, an ounce and a half. Form an ointment."

This was introduced as a substitute for the calamine cerate, oxide of zinc being supposed purer than calamine stone. There is little advantage, however, in the substitution of the more expensive oxide. Sometimes it is applied in ophthalmia.

UNGUENTUM OXIDI ZINCI IMPURI. Ointment of Impure Oxide of Zinc. Ed.

"Take of Simple Liniment, five parts; Prepared Impure Oxide of Zinc, one part."

UNGUENTUM TUTIÆ. Tutia Ointment. Dub.

"Take of Ointment of White Wax, ten ounces; Prepared Tutia, two ounces. Form an ointment."

This has been used as an application in chronic ophthalmia, but it appears to have no particular virtue.

UNGUENTUM SULPHURIS. Ointment of Sulphur. Ed.

"Take of Hogs' Lard, four parts: Sublimed Sulphur, one part. Mix thoroughly."

UNGUENTUM SULPHURIS. Sulphur Ointment. Lond.

"Take of Sublimed Sulphur, three ounces; Prepared Lard, half a pound. Mix them."

UNGUENTUM SULPHURIS. Sulphur Ointment. Dub.

"Take of Prepared Lard, four pounds; Sublimed Sulphur, a pound. Form an ointment."

Sulphur is applied under this form in psora, the surface affected with the eruption being rubbed with the ointment.

UNGUENTUM SULPHURIS COMPOSITUM. Compound Sulphur Ointment. Lond.

"Take of Sublimed Sulphur, half a pound; Root of White Hellebore, in powder, two ounces; Nitrate of Potash, a drachm; Soft Soap, half a pound; Prepared Lard, a pound and a half."

White Hellebore root has been applied with advantage in psora, and this compound ointment may perhaps prove successful in cases where the simple sulphur ointment might be more slow in its operation, or fail.

UNGUENTUM ELEMI COMPOSITUM. Compound Ointment of Elemi. Lond.

"Take of Elemi, one pound; Common Turpentine, ten ounces; Prepared Suet, two pounds; Olive Oil, two fluidounces. Melt the elemi with the suet, and having removed them from the fire, mix them immediately with the turpentine and oil; then strain through linen."

UNGUENTUM ELEMI. Elemi Ointment. Dub.

"Take of the Resin of Elemi, a pound; White Wax, half a pound; Prepared Lard, four pounds. Form an ointment, which strain, while warm, through a sieve."

This ointment is moderately stimulating, somewhat similar to the resinous ointment, and is appplied to the same purpose, that of exciting suppuration from an ulcer.

UNGUENTUM SAMBUCI. Ointment of Elder. Lond.

"Take of the Flowers of Elder, Prepared Lard, of each two pounds. Boil the flowers of elder with the lard until they become friable; then strain through linen."

UNGUENTUM SAMBUCI. Ointment of Elder. Dub.

"Take of the Fresh Flowers of Elder, three pounds; Prepared Lard, four pounds; Tallow, two pounds. Form an ointment in the same manner as the ointment of savine."

The elders flowers communicate to the unctuous matter a rich green colour. Ointments and plasters thus coloured by different herbs were formerly in use, but they have been discarded as possessed of no useful quality, and as the easier mode of giving them a colour, by the addition of some green pigment, came to be substituted in the shops instead of boiling the unctuous matter with the fresh vegetable.

UNGUENTUM VERATRI. Ointment of White Hellebore. Lond.

"Take of White Hellebore, rubbed to powder, two ounces; Prepared Hogs' Lard, eight ounces; Oil of Lemon, twenty minims. Mix them."

UNGUENTUM HELLEBORI ALBI. Ointment of White Hellebore. Dub.

"Take of Prepared Lard, a pound; Hellebore Root, in powder, three ounces. Form an ointment."

Hellebore is used, under this form, as an application to psora. It proves sometimes effectual, and is less disagreeable than the application of the sulphur ointment.

UNGUENTUM HYDRARGYRI PRÆCIPITATI ALBI. Ointment of White Precipitate of Mercury. Lond.

"Take of White Precipitate of Mercury, a drachm; Prepared Lard, an ounce and a half. To the lard melted with a gentle heat, add the precipitate of mercury, and mix them."

UNGUENTUM SUBMURIATIS HYDRARGYRI AMMONIATI. Ointment of Amniated Submuriate of Mercury. Dub.

"Take of Ointment of White Wax, a pound; Ammoniated Submuriate of Mercury, an ounce and a half. Form an ointment."

This is sometimes used as a very mild escharotic, and as a remedy in some cutaneous eruptions.

CERATUM SAPONIS. Cerate of Soap. Lond.

"Take of Hard Soap, eight ounces; Yellow Wax, ten ounces; Semivitrified Oxide of Lead, in powder, one pound; Olive Oil, one pint; Vinegar, one gallon. Boil the vinegar with the oxide of lead on a slow fire, stirring constantly until they unite together; then add the soap, and again boil in a similar mamer until the water is entirely dissipated; lastly, mix with these the wax previously melted with the oil: then mix with it the other ingredients, so as to form a cerate."

This composition must derive any efficacy it has, from the acetate f lead, formed by the boiling of the vinegar on the litharge, and it appears to be an operose process to obtain a composition which has no particular advantage.

UNGUENTUM PIPERIS NIGRI. Ointment of Black Pepper. Dub.

"Take of Prepared Lard, one pound; Black Pepper, rubbed to powder, four ounces. Form them into an ointment."

This must form a very stimulating ointment. For what purpose it is designed is not very obvious.

LINIMENTUM HYDRARGYRI. Liniment of Quicksilver. Lond.

"Take of the Strong Mercurial Ointment, Prepared Lard, each four ounces; Camphor, one ounce; Rectified Spirit, fifteen minims; Water of Ammonia, four fluidounces. Rub the Camphor first, with the spirit, then with the lard and mercurial ointment; lastly, adding gradually the water of ammonia, mix the whole together."

This is designed as a stimulating application and discutient, to be applied to indolent tumours or collections of fluid; by its stimulant action it may promote absorption, and the mercury introduced by the friction may exert a more permanent action.

LINIMENTUM TEREBINTHINÆ. Turpentine Liniment. Lond.

"Take of the Resin Cerate, a pound; Oil of Turpentine, half a pint. To the melted cerate add the oil of turpentine, and mix them together."

Oil of turpentine has been found to be a successful application to burns, and this liniment is a form under which it has been used.

CHAP. XXXI.

EMPLASTRA.—PLASTERS.

PLASTERS are of similar composition to ointments, but differ from them in their much firmer consistence, which is such, that they do not adhere to the hand. They owe this consistence, in general, to a larger proportion of wax, or sometimes to the addition of certain metallic oxides, particularly those of lead, which unite chemically with the unctuous matter. They require to be heated, in order to be spread: hence they adhere more firmly, and several of them even afford a mechanical support. They are employed generally to answer the same indications as ointments. The same rules are to be observed in their preparation as in that of Ointments.

EMPLASTRUM SIMPLEX. Simple Plaster. Ed.

"Take of Yellow Wax, three parts; Mutton Suet, White Resin, of each two parts; melt with a gentle heat, and stir until the mixture cools."

EMPLASTRUM CERÆ. Wax Plaster. Lond.

"Take of Yellow Wax, Prepared Tallow, each three pounds; Yellow Resin, a pound. Melt them together, and strain."

The principal use of this plaster is a dressing to the surface to which

a blister has been applied, after the vesicle has been cut. It is spread thin on linen with a hot iron.

Emplastrum Oxidi Plumbi Semivitrei. Plaster of Oxide of Lead. Ed.

"Take of the Semivitreous Oxide of Lead, one part; Olive Oil, two parts; Water, as much as may be necessary. Digest, stirring constantly, until the oil and the oxide unite into a plaster."

Emplastrum Plumbi. Plaster of Lead. Lond.

"Take of Semivitreous Oxide of Lead, rubbed into a fine powder, five pounds; Olive Oil, a gallon; Water, two pints. Boil them with a slow fire, stirring constantly, until the oil and the oxide of lead pass into the consistence of a plaster. It is necessary to add a little boiling water, if the water added in the beginning be evaporated before the end of the boiling."

Emplastrum Lithargyri. Litharge Plaster. Dub.

"Take of Litharge in fine powder, five pounds; Olive Oil, nine pounds; Boiling Water, two pints. Mix them together, by stirring at a heat between 200° and 212°, until the oil and the litharge unite into a plaster, supplying occasionally water in fresh quantities as it evaporates."

This, which has been long known by the name of Diachylon, is a chemical combination of the expressed oil with the oxide of lead, and is of a consistence sufficiently hard to form a plaster. There is considerable attention requisite in preparing it, particularly in stirring it constantly to promote the combination, and allow of the escape of the watery vapour. The use of the water is to prevent the heat from rising too high; and if the quantity is dissipated before the combination is complete an additional portion must be added, taking care to add it hot. The plaster is used, spread on leather or linen, as an application to excoriations, or slight wounds.

Emplastrum Resinosum. Resinous Plaster. Ed.

"Take of Plaster of Semivitreous Oxide of Lead, five parts; Resin, one part. Melt with a gentle heat, and continue stirring until the mixture cools and stiffens."

Emplastrum Resinæ. Resin Plaster. Lond.

"Take of Yellow Resin, half a pound; Plaster of Lead, three pounds. To the plaster of lead melted with a slow fire, add the resin bruised, and mix them."

Emplastrum Lithargyri cum Resina. Litharge Plaster with Resin, Dub.

"Take of Litharge Plaster, three pounds and a half; Yellow Resin, half a pound. To litharge plaster melted with a moderate heat, add the resin beat to a fine powder that it may melt speedily, and form a plaster."

The plaster of litharge is rendered more adhesive, and somewhat more stimulating, by this intermixture of resin. It is applied to similar uses.

Emplastrum Oxidi Ferri Rubri. Plaster of Red Oxide of Iron. Ed.

"Take of Plaster of Semivitreous Oxide of Lead, twenty-four parts; White Resin, six parts; Yellow Wax, Olive Oil, of each three parts; Red Oxide of Iron, in powder, eight parts. Rub the red oxide of iron with the oil, and add it to the other ingredients melted, then mix all thoroughly."

Emplastrum Thuris. Plaster of Frankincense. Dub.

"Take of Litharge, two pounds; Frankincense, half a pound; Red Oxide of Iron, three ounces. Sprinkle the oxide into the plaster and the frankincense melted together, stirring them together, and form a plaster."

These plasters, spread on leather, are sometimes used as an application in slight cases of lumbago, and give some relief, by affording a mechanical support.

Emplastrum Assafœtidæ. Assafœtida Plaster. Ed.

"Take of Plaster of Semivitreous Oxide of Lead, Assafœtida, of each two parts; Resin of Galbanum, Yellow Wax, of each one part. Add the resins after being melted and strained to the plaster and wax while melted, and mix them all thoroughly."

This plaster is sometimes applied to the breast or side, in hysteric affections, but probably with little advantage.

Emplastrum Ammoniaci. Ammoniac Plaster. Ed.

"Take of Ammoniac, five parts; Weak Acetic Acid, eight parts. Dissolve the ammonia in the acid, then evaporate the liquor in an iron vessel by the heat of a water-bath, stirring it until it obtain a proper consistence."

Emplastrum Ammoniaci. Ammoniac Plaster. Lond.

"Take of Gum Resin of Ammoniac, purified, five ounces; Acetic Acid, half a pint. Dissolve the Ammoniac in the vinegar; then evaporate the liquor in an iron vessel by the heat of a water-bath, stirring it until it attain a proper consistence."

Under this form, gum-ammoniac is applied as a discutient, and sometimes also as a remedy in tinea capitis.

Emplastrum Ammoniaci cum Hydrargyro. Plaster of Ammoniac with Quicksilver. Lond.

"Take of Purified Ammoniac, one pound; Purified Quicksilver, three ounces; Sulphurated Oil, one fluiddrachm. Rub the quicksilver with the sulphurated oil until the globules disappear; then add gradually the ammoniac melted, and mix them."

Emplastrum Ammoniaci cum Hydrargyro. Plaster of Ammoniac with Quicksilver. Dub.

"Take of Pure Gum-Ammoniac, a pound; Purified Quicksilver, three ounces; Turpentine, two drachms. Rub the quicksilver with the turpentine, until the globules disappear, then add gradually the ammoniac melted, and melt them together."

This is similar to the simple mercurial plaster, and its discutient and stimulant powers are perhaps promoted by the ammoniac. It is applied to the same purposes.

Emplastrum Gummosum. Gum Plaster. Ed.

"Take of Plaster of Semivitreous Oxide of Lead, eight parts; Gum-Resin of Ammoniac, Galbanum, Yellow Wax, of each one part. After dissolving the resins and straining them, add them to the plaster and wax melted, and mix thoroughly."

Emplastrum Galbani. Galbanum Plaster. Dub.

"Take of Plaster of Litharge, two pounds; Galbanum, half a pound;

Yellow Wax, four ounces. To the galbanum melted with a gentle heat, add the litharge plaster and wax, and melt them with a moderate heat."

Emplastrum Galbani Compositum. Compound Galbanum Plaster, Lond.

"Take of Galbanum Purified, eight ounces; Plaster of Lead, three pounds, Common Turpentine, ten drachms; Frankincense bruised, three ounces. To the galbanum and turpentine previously melted together. add first the frankincense, then the plaster of lead, melted with a slow fire, and mix them."

These three plasters are essentially the same. They are employed as discutient applications to indolent tumours, and sometimes to promote sup puration.

Emplastrum Opii. Opium Plaster. Ed. Lond.

"Take of Hard Opium in powder, half an ounce; Frankincense bruised, three ounces; Plaster of Lead, a pound. To the plaster melted, add the frankincense and opium, and mix them."

Opium has been used as an anodyne, by external application, with advantage, as, for example, in relieving toothach. This plaster is disigned to afford a form of applying it; but the usual mode of extending a piece of soft opium on leather or silk is to be preferred, as more effectual.

Emplastrum Hydrargyri. Quicksilver Plaster. Ed.

"Take of Oilve Oil, White Resin, of each one part; Purified Quicksilver, three parts; Plaster of Semivitreous Oxide of Lead, six parts. Rub the quicksilver with the oil and resin melted together, and then cooled until the globules disappear; then add gradually, the plaster of semivitreous oxide of lead, melted, and mix the whole carefully."

Emplastrum Hydrargyri. Quicksilver Plaster. Lond.

"Take of Purified Quicksilver, three ounces; Sulphurated Oil, a drachm; Plaster of Lead, a pound. Rub the quicksilver with the sulphurated oil until the globules disappear, then add gradually the plaster of lead, melted, and mix them."

The sulphurated oil in the latter formula causes the mercury to lose the form of globules more quickly, and thus abridges the labour of the preparation: but it may be doubted if the quicksilver thus extinguished is in the same state of activity as when this has been done by trituration with unctuous matter alone. The mercurial plaster is applied as a discutient to indolent tumours; and it has been supposed, that from its continued application, the mercury will be absorbed and act locally in glandular affections.

Emplastrum Saponaceum. Soap Plaster. Ed.

"Take of Plaster of Semivitreous Oxide of Lead, four parts; Gum Plaster, two parts; Hard Soap sliced, one part. Mix the soap with the plasters melted together; then boil a little, so as to form a plaster."

Emplastrum Saponis. Soap Plaster. Lond.

"Take of Hard Soap cut down, half a pound; Plaster of Lead, three pounds. Mix the soap with the plaster melted, then boil for a little."

Emplastrum Saponis. Soap Plaster. Dub.

"Take of Plaster of Litharge, three pounds; Shavings of Spanish Soap, half a pound. Mix the soap with the plaster melted with a gentle heat, then boil so as to form a plaster."

This has been supposed to possess a discutient quality; but it is much inferior to the mercurial plaster, and is scarcely ever used.

Emplastrum Cantharidis Vesicatoriæ. Plaster of Cantharides. Ed.

"Take of Cantharides, rubbed into a fine powder, White Resin, Yellow Wax, Mutton Suet, of each equal weights. Mix the cantharides with the other ingredients, melted together, and removed from the fire; and agitate continually until the mixture hardens."

Emplastrum Lyttæ. Plaster of Cantharides. Lond.

"Take of Cantharides, rubbed to a very fine powder, a pound; Wax Plaster, a pound and a half; Prepared Lard, a pound. Sprinkle in the cantharides to the plaster and lard melted together, and removed from the fire a little before they become solid, and mix the whole together."

Emplastrum Cantharidis. Cantharides Plaster. Dub.

"Take of Yellow Wax, Tallow, each a pound; Yellow Resin, four ounces; Cantharides, in fine powder, a pound. Sprinkle the Cantharides into the wax, tallow, and resin melted together, a little before they become solid from cooling, and mix them so as to form a plaster."

This is the plaster usually employed to raise a blister, an effect produced from the action of the acrid matter of the cantharides. It is of a softer consistence than the other plasters, that it may admit of being spread without the assistance of heat, which would impair the acrid quality. It is spread on leather, and requires to be applied twelve hours to produce a perfect blister; it is then removed; the vesicle is cut, and the inflamed surface is dressed with simple cerate or plaster. In cases where it is of importance that a blister should be raised with certainty, and speedily, it is of advantage to sprinkle a little of the powder of cantharides on the surface of the plaster when spread. Washing the part previously with vinegar, is also useful to insure the effect. Camphor is sometimes mixed with the blistering compositions, on the supposition that it prevents the strangury, which is somestimes produced by a large blister; but it appears to have no such virtue, and this painful symptom is more effectually obviated by the free use of diluents while the blister is applied,—a practice always proper where the system is irritable, or even in common cases where the blister is large.

Emplastrum Cantharidis Vesicatoriæ Compositum. Compound Plaster of Cantharides. Ed.

"Take of Venice Turpentine, eighteen parts; Burgundy Pitch, Cantharides, of each twelve parts; Yellow Wax, four parts; Subacetate of Copper, two parts; Mustard Seed, Black Pepper, of each one part. To the Burgundy pitch and wax melted, add the turpentine. While these are melted and still warm, add the other ingredients, mixed and rubbed to a fine powder, stirring constantly, until the mixture becomes cold and hard."

It occasionally happens, that the common plaster of cantharides is insufficient to excite a blister, even when its surface has been sprinkled over with powdered cantharides. In such cases, or even in others where it is necessary that a blister should be quickly raised, and where the system is not easily affected, as in comatose diseases, this more powerful composition may be employed. Its operation is accompanied with a very pungent sensation of heat. The application of it ought not to be continued too long, as it might induce ulceration; and from the greater acrimony of

this than of the common epispastic, still more precaution ought to be taken against the occurrence of strangury.

EMPLASTRUM CUMINI. Cumin Plaster. Lond.

"Take of Cumin Seeds, Caraway Seeds, Bay Berries, each three ounces; Burgundy Pitch, three pounds; Yellow Wax, three ounces. To the pitch and wax melted, add the other ingredients in powder, and mix them."

This has been applied to the region of the stomach as a moderate stimulant in hysteric affections and flatulent cholic, but it cannot be supposed to be of any advantage.

EMPLASTRUM PICIS COMPOSITUM. Compound Pitch Plaster. Lond.

"Take of Burgundy Pitch, two pounds; Frankincense, one pound; Yellow Resin, Yellow Wax, of each four ounces; Expressed Oil of Nutmeg, one ounce. To the pitch, resin, and wax, melted together, add first the frankincense, then the oil of nutmeg, and mix them together."

Burgundy pitch is in common use as a rubefacient, under the form of plaster. The addition of the other ingredients of this compound plaster may render it rather more stimulating, and the wax gives it due tenacity.

EMPLASTRUM CALEFACIENS. Warm Plaster. Dub.

"Take of Burgundy Pitch, seven parts; Plaster of Cantharides, one part. Mix them melted together with a moderate heat, and form a plaster."

By the addition of this small proportion of cantharides, the stimulating power of the Burgundy pitch is considerably increased. This accordingly affords a very excellent rubefacient, which is frequently employed.

EMPLASTRUM AROMATICUM. Aromatic Plaster. Dub.

"Take of Frankincense, three ounces; Yellow Wax, half an ounce; Cinnamon Bark in powder, six drachms; Essential Oil of Pimento, Essential Oil of Lemons, of each two drachms. Melt the frankincense and wax together, and strain. As they thicken on cooling, mix in the powder of cinnamon, rubbed with the oils, and form a plaster."

This is designed as a stomachic plaster, being applied to the region of the stomach, in some forms of dyspepsia. It ought to be always extemporaneously prepared, as the essential oils are soon volatilized.

CATAPLASMATA.—CATAPLASMS.

CATAPLASMA FERMENTI. Yeast Cataplasm. Lond.

"Take of Flour, a pound; Yeast of Beer, half a pint. Mix and apply a gentle heat, until the mixture begins to rise."

The yeast mixed with the flour, and aided by the heat, soon excites fermentation, and the cataplasm in this state has been applied with advantage as an anodyne in painful and irritable sores, and as an antiseptic in ulceration, attended with fœtor. Its efficacy depends on the carbonic acid gas evolved by the fermentative process.

CATAPLASMA SINAPIS. Mustard Cataplasm. Lond.

"Take of Mustard Seeds, Lintseed, of each in powder, half a pound:

Vinegar, warm, as much as is sufficient. Mix, so as to obtain the consistence of cataplasm."

CATAPLASMA SINAPEOS. Mustard Cataplasm. Dub.

"Take of Mustard Seed in powder, Crumb of Bread, of each half a a pound; Wine Vinegar, as much as is necessary. Mix so as to form a cataplasm. The mustard cataplasm may be made more acrid by adding two ounces of Horse Radish Root, scraped down."

The Mustard Cataplasm, or Sinapism, is the composition usually applied as a stimulant to the soles of the feet, in typhus, where there is determination to the head, and in comatose affections. It acts as a powerful rubefacient; its action is attended with a sense of heat and pain, which soon become urgent, and hence, in a state of coma, the application ought not to be continued too long. It operates on the same principle as a blister, and differs principally in its effects being more quickly obtained, and being more powerfully stimulant to the general system, without producing the same superficial inflammation.

APPENDIX.

Under this Appendix I have placed some subjects connected with Materia Medica and Pharmacy, which could not otherwise be arranged with equal advantage. Mineral Waters are complicated in their composition, and, according to the substances they contain, produce different effects on the system. They are therefore employed to answer different indications; and are hence not easily arranged under the classes of the Materia Medica, when these are established on analogies in medicinal operation. It is also of advantage to give a connected view of their chemical analysis, and on this account to place them together. The Elastic Fluids that have been employed medicinally require a similar arrangement, as there is the same difficulty in placing them under the respective classes of medicines; and from the peculiarities in their preparation and mode of operation, the same advantage in giving their history in connection. I have added a few observations on the medical employment of Electricity and Galvanism, to complete the view of what properly belongs to Materia Medica. As connected with the subject, I have subjoined a few observations on the doses of medicines, and the rules that regulate extemporaneous prescription, to which I have added a table of doses, and tables of nomenclature, according to the different Pharmacopœias.

I.—OF MINERAL WATERS.

Waters, which flow at the surface of the earth, are frequently impregnated with foreign matter, so as to acquire taste or odour, and to be capable of producing changes in the state of the living system. Such waters are denominated Mineral, it being usually matter belonging to the mineral kingdom which communicates these powers.

Important medicinal effects are frequently obtained from mineral waters, arising primarily from the operation of the substances which they hold dissolved, though this is aided by the state of dilution, the action of the water itself as a diluent, and by other external circumstances. The chemical analysis, therefore, of these waters is of importance, as determining the principles in which their active powers reside, and thus enabling the physician to employ them with more advantage and discrimination.

Mineral waters, both in a chemical classification, and in relation to their medicinal use, may be arranged under four orders; Carbonated Mineral Waters, or those impregnated with carbonic acid gas; Sulphureous Mineral Waters, or those impregnated with sulphuretted hydrogen; Saline Mineral Waters, or those which hold certain neutral salts in solution; and Chalybeate Mineral Waters, or those, the properties of which depend on an impregnation of iron. These indeed are not perfectly insulated, but, in general, those of one division have a relation to those of the others, by being likewise impregnated with one or other of the ingredients which these contain. But still each may be classed according to its predominant ingredient, or that which gives it its most characteristic chemical and medicinal powers.

It would be foreign to the object of this outline, to give the minute details connected with the analysis of mineral waters. This belongs to a System of Chemistry. It will be sufficient to point out the general modes of discovering their principles, and to add to this chemical view, a brief account of their medicinal applications.

1. Carbonated Mineral Waters.—The waters referred to this class are those which contain carbonic acid gas; to bring them under the appellation of mineral waters, however, this must be present in such quantity as to communicate certain sensible qualities. Waters impregnated with free carbonic acid gas, sparkle when drawn from the spring, or when poured into a glass; they have a taste pungent and acidulous, but become vapid from exposure to the air. Along with the carbonic acid, there are generally present, portions of saline, earthy or metallic matter, chiefly carbonates of lime, magnesia, and iron. But the carbonic acid in excess still communicates the same sensible qualities, modified particularly with regard to medicinal powers, by these impregnations.

Carbonic acid in excess, in a mineral water, is discovered, when present in any considerable proportion, by the qualities above enumerated. It is also easily distinguished, even when in more minute quantity, by chemical tests. Infusion of litmus receives from the addition of the water a red tint, which is evanescent, disappearing from exposure to the air, and more quickly when heat is applied. And lime water produces a milkiness or precipitation: the lime, when the lime water is added in due proportion, forming with the carbonic acid, carbonate of lime, which is insoluble. But the turbid appearance is removed, and the transparency restored, either by adding an additional quantity of the mineral water, the excess of carbonic acid rendering the carbonate soluble, or by adding a few drops of nitric or muriatic acid, either of which decomposes the carbonate, and dissolves the lime. By the evanescent redness, carbonic acid is discriminated from any other free acid that a mineral water might hold dissolved; and by the precipitate formed by lime disappearing on the addition of a larger quantity of the mineral water, or of a little muriatic or nitric acid, the fallacy is guarded against that might arise from any precipitation produced by sulphates that the water might contain.

The quantity of carbonic acid contained in mineral waters is very various. Under a common pressure, pure water absorbs its own volume of the gas, but the quantity in any mineral water is generally inferior to this. The quantity is discovered by expelling the gas from the water, by heating it gradually in a retort nearly filled to the neck, and receiving the elastic fluid in a graduated jar, over quicksilver: the diminution of volume it sustains, by the introduction of a solution of potash, is then observed; and this gives the volume of carbonic acid gas.

Waters highly impregnated with carbonic acid gas are grateful from their pungency, sit light on the stomach, and in a large dose produce a sensible degree of exhilaration; they increase the appetite, and generally have a diuretic effect. They prove useful in dyspeptic affections, from the grateful and moderate stimulus exerted by the carbonic acid on the stomach, aided by the diluent operation of the water, and hence the advantage derived from them in the numerous chronic affections connected with impaired power of the digestive organs, and particularly in simple dyspepsia, in hypochondriasis and gout. They generally also contain some saline substances, which communicate additional powers, and the opera-

tion of these is promoted, or at least they are rendered more grateful, by the carbonic acid. Those which contain carbonate of soda, as Seltzer water, prove more powerfully diuretic, and are employed with advantage, as palliatives in urinary calculus, and the painful discharge of urine from other affections of the urinary organs. Those impregnated with iron are more particularly employed in those diseases in which that metal is beneficial. Some of the most celebrated mineral waters of Europe belong to this class, such as the Spa, Pyrmont, and Seltzer water. The Pyrmont contains nearly its own volume of the gas; the Seltzer, more than half its volume; the Spa, rather less than half the volume: they besides hold dissolved carbonates of soda, lime, and magnesia; and the Spa and Pyrmont have a considerable impregnation of carbonate of iron. Their more minute analysis will be found in the table at the end of this article. None of the mineral springs of this country are much impregnated with carbonic acid; and those which contain it, as the waters of Bristol and Cheltenham, derive more activity from the presence of other substances.

II. Sulphureous Mineral Waters. These waters owe their distinguishing character to an impregnation of sulphuretted hydrogen, and are at once recognised by their peculiar fœtid smell They are transparent when drawn from the spring, but become turbid from exposure to the air, and gradually lose their odour. When strongly impregnated, they redden infusion of litmus, and in their weakest state give a dark precipitate with solution of nitrate of silver, or acetate of lead, and tarnish the metals.

To estimate the quantity of sulphuretted hydrogen gas contained in these waters, various methods have been employed. The gas is not expelled entirely by heat, nor is it easily collected, so as to measure it accurately, water absorbing it, and quicksilver decomposing it; it may also have an intermixture of carbonic acid gas, and the proportion of this is not easily ascertained, both gases being absorbed by the same liquids. The usual mode is to decompose the sulphuretted hydrogen, by adding to the water, highly fuming nitrous acid, as long as there is any precipitation of sulphur. This precipitation is owing to the oxygen of the acid combining with the hydrogen of the sulphuretted hydrogen. Instead of adding the acid, Kirwan employed the method of filling a jar with the water, and mixing over it inverted, nitric oxide gas with atmospheric air, when nitrous acid is formed, and produces a similar decomposition. The manipulation, however, is difficult, and does not appear to have any advantage over the more simple method of adding the fuming acid. The sulphur precipitated in either mode is collected on a filter, and from its quantity, the quantity of sulphuretted hydrogen is inferred, 30 grains of sulphur being supposed to be contained in 100 cubic inches of the gas. This estimate, however, of the proportion of sulphur in sulphuretted hydrogen is somewhat uncertain, and the method is liable to some fallacy, from the action of the acid becoming weak by its dilution, so as not to precipitate the whole of the sulphur, or, if it be used in excess, from its communicating oxygen, and converting it partially into sulphuric acid.

The sulphureous mineral waters usually contain saline substances, which modify their powers. From the action of the sulphuretted hydrogen, they are employed in cutaneous affections; and from the combined action of this and the saline matter, which generally has a purgative effect, they

are farther used in diseases of the digestive organs, dyspepsia, hypochondriasis, torpor of the intestines, visceral obstructions, and in scrofulous affections. They are also applied externally in cutaneous eruptions; and the warm sulphureous baths have been in particular celebrated for their efficacy under this form of application. The principal sulphureous mineral waters of this country are those of Harrowgate and Moffat: the former have a large proportion of saline matter, muriates and carbonates. Those celebrated on the Continent are chiefly the warm sulphureous springs of Aix la Chapelle and Barêge.

III. Saline Mineral Waters.—Under this class are comprised those waters in which, without any large proportion of aërial matter, various saline compounds, generally neutral, exist. The salts usually present are sulphates, muriates, and carbonates: and the basis with which the acids forming these are combined, are soda, magnesia and lime. Their analysis is accomplished, first, by detecting, by the employment of tests, the acids present and the bases which these are neutralized; and, secondly, obtaining either the salts themselves, or their elements by evaporation, or by the action of certain re-agents.

In these waters, there is often an impregnation of elastic fluid, particularly of carbonic acid, which would modify the results from the application of tests. This is expelled by heat in order to facilitate the farther analysis; and in general also, it is of advantage to reduce the volume of the water by evaporation, as the operation of tests becomes then more sensible than under a state of great dilution.

Sulphuric acid, in any state of combination in a mineral water, is discovered with great delicacy by muriate or nitrate of barytes, the barytes attracting it, and forming a compound not sensibly soluble, the production of which, therefore, gives rise to a turbid appearance, and precipitation. The only fallacy that requires to be guarded against is, that the same apparent result may be produced by carbonic acid present in the mineral water, either in a free or combined state; but this is easily discovered by the precipitation or turbid appearance from the action of carbonic acid being removed, by the addition of a few drops of nitric acid, or not appearing if this has been added to the mineral water previous to the addition of the muriate of barytes. Other tests of sulphuric acid have been employed, such as superacetate of lead, and nitrate of mercury; but these are both less delicate and less accurate.

Muriatic acid is detected by nitrate of silver, the oxide of silver combining with the muriatic acid, and forming an insoluble compound, which gives to the water first a bluish white turbid appearance, and ultimately a precipitate. This test is extremely delicate, and detects the most minute quantity of muriatic acid, in any state of combination whatever. But it is liable to fallacies, against which it is necessary to guard. The principal of these arise from the presence of carbonic acid or sulphuric acid, either of these giving rise likewise to milkiness and precipitation on the addition of the solution of silver. The operation of carbonic acid is prevented by previously adding a little pure nitric acid to decompose any carbonate: that of sulphuric acid can be obviated only by removing it by the previous addition of nitrate of barytes, as long as any precipitation is induced. If, on adding to the transparent fluid, after these preliminary experiments, the nitrate of silver, any milkiness is produced, this indicates the presence of muriatic acid. Sulphuretted hydrogen gives a precipitate

with this test ; but the nature of this is, from its dark colour, sufficiently evident.

Carbonic acid, in a combined state, is detected by muriate of barytes producing a turbid appearance, and a precipitation, which are removed by the addition of a few drops of nitric acid. Waters containing any considerable proportion, either of alkaline or earthy carbonates, affect the vegetable colours, changing when there is no excess of carbonic acid, or when this is removed by ebullition, the colour of Brazil wood, which is red, to a tint of blue, or restoring the blue tint of litmus which has been reddened by the addition of a little vinegar. When the water is reduced by evaporation, effervescence is excited on the addition of an acid ; and during the evaporation, the earthy carbonates are precipitated, while the alkaline carbonates remain dissolved, and are discovered by their power of changing the yellow colour of turmeric to a brown.

These acids are usually combined with soda, lime, or magnesia ; and to complete the analysis by the application of tests, these bases must be discriminated.

Lime is detected, with the greatest delicacy of effect, by oxalic acid. The acid indeed with which the lime is combined in the water, when evolved by the action of the oxalic acid, is liable to re-act on the precipitate, and retain it in part dissolved ; but this may be guarded against by using oxalate of potash. Magnesia is precipitated by the same acid ; but this can scarcely give rise to any fallacy, as this precipitation takes place very slowly, while that with lime is immediate.

Magnesia is precipitated by ammonia partially, and by lime water entirely ; the principal fallacy to which both tests are liable is, that argil is also precipitated by them, and though this earth is not of very common occurrence in mineral waters, it is occasionally found. The best method of distinguishing them is to dry the precipitate, and boil gently a solution of potash on it, this dissolving argil, but leaving magnesia undissolved. Succinate of ammonia, it has lately been discovered, precipitates argil, but not magnesia, and forms therefore a delicate test. In using lime water as the precipitant, it is necessary to guard against the fallacy that may arise from the presence of carbonic acid, free or combined, with which the lime may unite, and form a precipitate ; this may be avoided by removing any carbonic acid by the previous addition of a little nitric acid. Any sulphuric acid also that may be present ought to be removed by nitrate of barytes, as it might unite with the lime, and give rise to a precipitate of sulphate of lime. Another mode of distinguishing between lime and magnesia is, to precipitate by carbonate of potash, and then, by adding sulphuric acid to the precipitate, to form a sulphate which will be soluble if of magnesia, and nearly insoluble if of lime.

Soda, which is the alkaline base almost exclusively found in mineral waters, cannot be discovered by any test, such as that by which we discriminate the preceding ingredients. The presence of it, therefore, is inferred, when the analysis discovers acids in the water, which are not uncombined, and which, at the same time, cannot be inferred from the application of tests to be in combination with earthy bases. It is also discovered in a state of combination with any of the usual acids by evaporation, carried so far, that its salts are obtained crystallized. By the same method the other compound salts, those having lime, magnesia, or argil, for their base, are also discovered, and hence evaporation is always em-

ployed, in combination with the use of tests, in conducting the analysis of a mineral water. Different substances separate at different stages of the evaporation, according to their degrees of solubility; the earthy carbonates are first precipitated, afterwards the earthy sulphates, at least the sulphate of lime; the clear liquor poured off and allowed to cool affords the alkaline neutral salts and sulphate of magnesia by crystallization; the muriates of magnesia and lime usually remain dissolved in the residual liquor, and by these separations the analysis is facilitated.

Advantage is also taken of the powers of alcohol, both as a solvent and as a precipitant, to separate these substances. When the water is reduced to a concentrated state by evaporation, the addition of alcohol throws down certain salts, while others remain dissolved; and of those which are precipitated, some are thrown down by a small quantity of alcohol, or when the evaporation has not been carried far; while others are separated only when the alcohol is added in larger proportion, or when the water is farther evaporated. Thus, sulphate of lime is first precipitated, then carbonate of lime and carbonate of magnesia, afterwards sulphate of soda and sulphate of magnesia, while the muriates in general remain dissolved. In applying the solvent power of alcohol to facilitate the analysis, the water is evaporated to dryness, and this dry matter is submitted to the action of alcohol: the muriates which are present are in general dissolved, while the sulphates and carbonates remain undissolved.

By these operations, too, the quantities of the respective salts contained in a water are determined; the substances separated being either brought to a certain state of dryness, or being dissolved separately in water and crystallized. The quantities are also sometimes inferred, by estimation from the precipitates afforded by re-agents; the quantity of sulphuric acid, for example, being determined from the weight of the precipitate of sulphate of barytes, obtained by the addition of muriate of barytes; that of muriatic acid from the weight of the precipitate of muriate of silver, obtained by the addition of nitrate of silver; and that of lime from the weight of the precipitate of oxalate of lime; these quantities being inferred according to the composition of these compounds, as they have been determined by the most accurate experiments. In general, these methods require to be combined to insure accuracy, especially with regard to the determination of proportions.

The substances obtained by evaporation, or by these analytic methods, have always been considered as the ingredients of the mineral water. There can be no doubt, however, but that the state of combination is often liable to be changed by the analytic process, and that the substances obtained are, from this cause, sometimes products of the operation, and not original ingredients. The importance of this, in determining the composition of mineral waters, and in explaining the source of their medicinal powers, first occurred to me in conducting the analysis of a mineral water, (that of Dunblane), which afforded by evaporation, muriate of soda, muriate of lime, and sulphate of lime. These, according to the conclusions generally drawn, would have been considered as the real ingredients; but without any just proof; for it is equally possible that the sulphuric acid might exist in the water in the state of sulphate of soda, and that, during the evaporation, this acting on a portion of the muriate of lime, might form muriate of soda, and sulphate of lime. Various considerations rendered this even the more probable conclusion, as I have stated in a Memoir on this subject, (Edinburgh Philosophical Transactions, vol. 7.):

and in all cases in which muriate of soda and sulphate of lime are obtained from a mineral water by evaporation, or by any analogous analytic operation, the portions of them equivalent to each other are to be regarded as products of such a decomposition. A similar conclusion may be drawn, where carbonate of lime or carbonate of magnesia is obtained, if muriate of soda is obtained along with them. The quantities of them equivalent to the proportional quantity of muriate of soda may be regarded as products of the action of carbonate of soda on muriate of magnesia and muriate of lime; and the same view may sometimes even be applied to the production of sulphate of magnesia. Thus, the real composition of a saline mineral water will often be very different from that directly inferred from the products of its analysis.

This view often leads to a satisfactory explanation of the medicinal powers of mineral waters, which, on the common doctrine, are very imperfectly accounted for. No better example can be given to illustrate this, than the celebrated Bath water. It affords, in a pint, about 9 grains of sulphate of lime, 3 grains of muriate of soda, 3 grains of sulphate of soda, $\frac{8}{10}$ths of a grain of carbonate of lime, $\frac{1}{5}$th grain of silica, and $\frac{1}{70}$th grain of oxide of iron,—substances either so inert, or in such minute quantities, that no sensible effect could be expected from them. But if we adopt the opposite view, the real ingredients are 5.2 grains of sulphate of lime, 3.1 grains of muriate of lime, 5.5 grains of sulphate of soda, $\frac{8}{10}$th grain of carbonate of lime, $\frac{1}{5}$th grain of silica, and $\frac{1}{70}$th of oxide of iron,—a composition which, from the presence of the muriate of lime in particular, is much more active, and accounts much better for its medicinal powers.—Seltzer water affords another striking example of a similar kind. Along with a large impregnation of carbonic acid, it contains, according to Bergman, in a pint, 3 grains of carbonate of lime, 5 grains carbonate of magnesia, 4 grains carbonate of soda, 17.5 muriate of soda. But the real composition, according to the preceding view, is 3.3 grains of muriate of lime, 5 grains muriate of magnesia, 7.8 grains muriate of soda, and 18 grains carbonate of soda,—a composition totally different from the former, and approaching much more to what is to be expected from the great activity of this mineral water.

Thus, the composition of saline mineral waters is often very different from what would be inferred, if the substances obtained by their analysis were to be regarded as the real ingredients. Some have supposed, that no binary salts exist together in solution in water, but that, in such cases, only one combination, properly speaking, exists, formed by the simultaneous union and mutual neutralization of the different acids and bases present. It is more probable, however, that binary combinations exist; and it is only necessary to guard against the error of supposing, that they are always those afforded by the analysis.

Saline Mineral Waters are usually aperient, the substances which they hold dissolved being either so far as can be determined inert, such as the sulphate and carbonate of lime, or being cathartic, as the greater number of the other compound salts. It has always been remarked, with regard to them, that their cathartic power is greater than could be supposed from the extent of their saline impregnation, as determined by analysis; —a proof of the influence of dilution in the operation of mineral waters. They are usually employed in diseases where it is of advantage to stimulate the digestive system, the intestinal canal, and the secreting organs connected with it, or where advantage is derived from moderate and con-

tinued evacuations. Hence their celebrity in the treatment of some forms of dyspepsia and hypochondriasis, chlorosis, chronic hepatitis, jaundice, and in scrofula. The most noted saline water is that of Sedlitz: that of Seltzer, along with a portion of saline matter, has a large impregnation of carbonic acid, and that of Cheltenham, an impregnation both of carbonic acid and iron. Pitcaithly Spring in this country, affords an example of a pure saline water, its principal ingredients being muriate of lime and muriate of soda, with a slight impregnation of carbonic acid. Some mineral waters which belong to this class contain so little saline matter, that their medicinal effects must be principally ascribed to the temperature, and to the action of the water as a diluent: such are the warm mineral waters of Buxton and Matlock, and the cold spring of Malvern. The last was supposed to be water uncommonly pure. It contains, however, about five grains of carbonate of soda in a gallon, with a very minute quantity of carbonate of iron.

When saline waters are impregnated with carbonic acid, which they frequently are, they become more grateful, and sit easier on the stomach. When they have an impregnation of iron, they acquire tonic powers, and more efficacy as remedies in amenorrhœa, and the other chronic diseases in which this metal is employed: and the muriate of soda and muriate of lime, which some of them contain, probably render them more beneficial in scrofula and affections of the glandular system.

Sea water, in strict chemical arrangement, must be regarded as belonging to the class of saline mineral waters, as it holds dissolved merely various neutral salts, chiefly muriate of soda and of magnesia, and sulphate of soda and magnesia, with a little sulphate of lime. It much exceeds, however, in the extent of impregnation, any common mineral water: the proportion of saline matter varies in different latitudes, according to the temperature, producing greater or less evaporation; and it is liable to be varied by the discharge of large rivers into the ocean. But on an average, the quantity appears to be about $\frac{1}{29}$, of which, from the experiments of Bergman and Lavoisier, it follows, that about 20 are muriate of soda, 5 muriate of magnesia, 3 sulphates of magnesia and soda, and 1 sulphate of lime. Its medicinal powers are similar to those of the saline mineral waters: from the extent of its saline impregnation, it is more active as a cathartic; and it is more stimulating than fresh water as a bath.

IV. Chalybeate Mineral Waters.—These owe their characteristic properties, chemical and medicinal, to an impregnation of *Iron*. The oxide of iron is almost uniformly held dissolved by carbonic acid, the acid being usually in excess; in a few mineral waters, sulphate of iron is present; but these are not of common occurrence, and are in general too active to be well adapted to medicinal use.

Chalybeate waters have a peculiar styptic taste; they are transparent when taken from the spring, but when exposed for some time to the air, a pellicle forms on the surface, and a quantity, generally minute, of ochry sediment subsides, the water at the same time losing its taste; this change is accelerated by heat.

Iron is discovered, with great facility, by chemical tests. Prussiate of potash detects it by the blue colour to which it gives rise; infusion of galls by the purple colour which it strikes. The latter test is more delicate than the former, and it is much more accurate; the prussiate of potash being always liable to fallacy, from the difficulty of obtaining it free from

iron; hence the infusion of galls, or rather the tincture of galls, ought always to be preferred. The principal circumstances to be remarked with regard to its operation, is, that the purple colour which it strikes is liable to be altered in its tint by the presence of other substances: alkaline and earthy carbonates in particular render it violet; neutral alkaline salts appear to deepen the purple colour, and sulphate of lime renders the precipitate at first whitish, and afterwards black. Carbonate of lime has a singular effect: if the iron is in a low state of oxidation, it heightens the colour; but when the oxidation is greater, it has the opposite effect: and if the quantity of iron be small, the colour may even not appear on the addition of the test. This fact, discovered by Mr. Phillips, gives the explanation of a singular circumstance with regard to the Bath Mineral Water,—that when newly taken from the spring, and while still warm, it gives a purple colour with galls, indicating the presence of iron; while, after exposure for a little time to the air, no colour appears, though no oxide of iron has been precipitated.

By applying the test of galls before and after boiling the mineral water, we are enabled to discover whether the iron is held dissolved by carbonic or sulphuric acid; the carbonic acid being expelled by the ebullition, and the oxide of iron precipitated, so that, after filtration of the liquor when cold, the purple colour does not appear; while the sulphate, though likewise partially decomposed by the ebullition, still so far remains, that a colour not much fainter will be produced. The presence of carbonic or sulphuric acid may also be determined by their usual tests, and sulphate of iron may be obtained by evaporation.

The quantity of oxide of iron may be determined from its precipitation, on exposure to the air; the whole, or very nearly the whole of it, when it is combined with carbonic acid, being precipitated, in consequence partly of the escape of the acid, and partly of the iron passing to a higher state of oxidation, so that its attraction to the acid becomes weaker. It has also been estimated from the weight of the precipitate, formed by the addition of prussiate of potash or infusion of galls; or by a more recent mode, precipitating it by the addition of succinate of soda, and afterwards decomposing the precipitate of succinate of iron, by exposing it to a red heat with a little carbonaceous matter, 100 parts of the oxide obtained by the calcination containing about 70 of iron. Benzoate of soda, which is a cheaper salt, may be used for the same purpose, 100 parts of the precipitated benzoate of iron dried by exposure to the air containtaining 25 of red oxide of iron.

Chalybeate mineral waters are remedies of considerable activity and power. They act as tonics, increasing the strength of the system, raising the force of the circulation, giving tone to the digestive organs, augmenting muscular vigour, and promoting the excretions. They are of course employed in those diseases in which iron is principally used, amenorrhœa, chlorosis, some states of menorrhagia, leucorrhœa, dyspepsia, scrofula, and various forms of chronic debility. And as iron succeeds best when given in small doses, and in a state of considerable dilution, the chalybeate waters afford the best form under which it can be prescribed, that which is at once attended with least irritation, and from which the greatest benefit is obtained. The powers of these waters, too, are often aided by the presence of other ingredients. The impregnation of carbonic acid, when it is present in excess, gives them a grateful stimulant quality, which

is exerted on the stomach; and saline substances communicate to them an aperient power.

One of the purest chalybeate waters, as will be perceived from the annexed table, is that of Tunbridge. In the celebrated Spa and Pyrmont waters, the impregnation of carbonic acid is so great, as very materially to modify the action of the iron; and in the Cheltenham water, the quantity of active saline matter is such, that it can scarcely be regarded as a chalybeate.

Besides the substances which have been enumerated as forming the preceding classes of mineral waters, there are some principles common to all of them, so as to be occasionally found in those of each class; and there are some also, which are of very rare occurrence, either of which scarcely require more than a concise enumeration.

Atmospheric air is contained in all water that flows at the surface of the earth, and renders it more grateful and light as drink. It scarcely appears to be contained in more than the usual proportion in any mineral water, while in those in which other elastic fluids are present in large quantity, it is probably deficient. Neither does it appear that *Oxygen* gas is ever present in a proportion larger than that in which it exists, as a constituent of the atmospheric water. *Nitrogen* gas is afforded by some mineral springs. It had often been observed, that, in the mineral spring at Buxton, a quantity of elastic fluid is discharged with the water, and a portion escapes on exposure from the water itself. This was supposed to be carbonic acid; but Dr. Pearson discovered it to be nitrogen gas, mixed with a little atmospheric air. The same gas was afterwards discovered by Dr. Garnet in the mineral waters of Harrowgate, and has since been found in others. It is probably derived from the oxygen of the atmospheric air, with which water is impregnated, being abstracted by other substances present in the mineral water, particularly by sulphuretted hydrogen or oxide of iron, leaving the nitrogen in combination with the water. *Sulphurous acid gas* has been found in some hot mineral waters in the neighbourhood of volcanoes. The *Mineral acids* have likewise, though rarely, been found uncombined, or at least in excess. *Sulphate of Alumine* and *Sulphate of Iron* sometimes occur, arising probably from the oxygenation of aluminous slate impregnated with sulphuret of iron, through which the water has passed. *Muriate of Manganese* has been detected in minute quantity. Lastly, *Silex* exists in solution, especially in hot springs. It is deposited abundantly from the water of the Geyser fountain in Iceland. It is dissolved in the water of the hot springs of Carlsbad, in the Bath waters, and in many others, and is in general discovered by forming, when the water is evaporated to dryness, a residuum insoluble in acids, and having, previous to its perfect exsiccation, more or less of a gelatinous consistence.

The temperature of mineral waters gives rise to an important distinction among them. The greater number are at the average annual temperature of the place where the spring is situated; others are superior to this, or are positively warm. This modifies their powers. The warmth of the tepid waters render them more stimulating when swallowed, a glow being felt in the stomach, and sometimes the head is slightly affected. When externally applied under the form of the bath, the temperature has a more important influence on their operation, than any impregnation they may have.

In the following table is presented the results of the analysis of the most

celebrated mineral waters. They are arranged as nearly as possible according to the preceding classes, though there is considerable difficulty with regard to some of them, which, from the substances they hold dissolved, belong to one class as well as to another. Thus the Spa and Pyrmont waters belong both to the classes of carbonated and chalybeate waters. I have placed them under the former, as the impregnation of carbonic acid is so very considerable, and gives them probably their most important properties. Cheltenham water may be placed either as a saline or as a chalybeate water. I have given it the former rank, as the saline matter appears to give it its principal activity. There are other mineral waters so free from any foreign matter, that their proportion must be ascribed to the fluid acting partly by its temperature, and partly as a diluent; or if in some of these the analysis indicates a certain portion of foreign matter, the substances are in general not different from those in common spring water, and are in smaller quantity, and hence cannot communicate any great degree of active power. These I have placed under those classes, with which, judging both from their analysis and their operation, they are most nearly connected. With regard to the temperature, I have thought it sufficient to add the epithet *cold*, where the temperature is not above that of the external atmosphere; where it exceeds this, the precise degrees are added. The proportions of the ingredients are those contained in a wine gallon of the water. It is also to be observed, that the composition assigned is that founded on the principle which has always been assumed, that the substances obtained from a mineral water by evaporation are its ingredients; while in many cases, in those especially where they are substances of sparing solubility, such as sulphate and carbonate of lime, they are, as has been above explained, products of the operation. This gives a different view of the composition, which may always however be inferred from the other.

WATERS.	Nitrogen.	Carbonic acid gas.	Sulphuretted hydrogen gas.	Carbonate of Soda.	Carbonate of Magnesia.	Carbonate of Lime.	Sulphate of Soda.	Sulphate of Magnesia.	Sulphate of Lime.	Muriate of Soda.	Muriate of Magnesia.	Muriate of Lime.	Oxide of Iron.	Silex.	Temperature.
Carbonated.		cub. in.	cub. in.	grains.	grains.	grains.	grains.	grains.	grains.	grains.	grains.	grains.	grains.	grs.	
Seltzer,		138		32	40	24				140					Cold
Pyrmont,		208			80	34.8		44.5	63.6	12.4			4.5		Cold
Spa,		104		11.7	35.3	11.7				1.37			4.5		Cold
Carlsbad,		32 to 50		39		12	70			34.6			0.125	2.5	165°
Sulphureous.															
Harrowgate,	7	8	19		5.5	18.5		10.5		615.5	91	13			Cold
Moffat,	4	5	10							36					Cold
Aix la Chap.			Supersulphuretted hydrogen.	90		38				40					143
Saline.															
Sedlitz,		8			21	6.7		1444	41.1		36.5				Cold
Cheltenham,	12.	30.3	3		12.5		480		40	5	12.5		5		Cold
Plombieres,				4.4		1	4.7			0.5				2.6	
Pitcaithly,		8				5			5.5	100		180			
Bristol,		30				13.5	11.2		11.7	4	7.25				74°
Buxton,	2					10.5			2.5	1.7			0.25		82°
Chalybeate.															
Tunbridge,	5	10.6							1.25	0.5	2.2		1		Cold
Brighton,		18							32.7	12.2	6		11.2	11.2	Cold
Bath,		9.6				6.4	12		72	26.4			.016	1.6	116

The practicability of imitating the mineral waters has engaged the attention of Chemists. With regard to the active saline waters, it is easily done, by dissolving the due proportions of the compound salts in water corresponding to the analysis of the water designed to be imitated. We may also impregnate the solution with carbonic acid gas, and even with sulphuretted hydrogen; and by the medium of carbonic acid, it might receive an impregnation of iron. Directions for conducting these processes have been given by Bergman. But in all these cases there will be wanting the confidence on the part of the patient in the efficacy of the artificial water, which, if not necessary to its success, is at least requisite to its continued and regular use: the external advantages, too, attending the visit to a mineral spring, may not always be obtained. Hence these artificial waters, designed as substitutes for the natural ones, have never been established in use. Water impregnated with carbonic acid, with the addition of an alkaline carbonate, which is now in general use, may be considered as operating on a similar principle; and to this supercarbonated soda, or supercarbonated potash water, a small quantity of any of the purgative salts is often added with advantage, communicating to the water an aperient quality, while the taste of the salt is covered, and it is rendered more grateful to the stomach.

II.—OF THE GASES EMPLOYED AS REMEDIES.

Substances existing in the aërial form might *a priori* be supposed capable of producing important effects on the system, as by respiration they are brought to act on the mass of blood, and induce in it chemical changes. They occasion, too, important alterations in the functions of life, some of them producing the highest excitement, others occasioning depression and exhaustion of power. And in the classes of aërial substances, we have actually the two extremes of stimulant and sedative power, in the examples of nitrous oxide and carburetted hydrogen.

Though the expectations that were at one time formed with regard to their medicinal efficacy, have not been realized, and the use of them is nearly relinquished; yet since they are capable of producing such changes in the state of the functions, and of the general system, and since the proposition must be admitted, that every substance possessed of these powers may be capable of producing medicinal effects, they ought to be entirely lost sight of, and a few observations on their operation are necessary to complete the history of Materia Medica. There are some applications, too, of their chemical agency to medicinal purposes, which require to be taken notice of.

The modes of preparing these gases are, in a great measure, peculiar to each. The manner of administering them is nearly the same. They may be breathed from a jar placed in water; but this is laborious, from the effort required to sustain the column of water within the jar. This may be partly remedied, by poising the jar in water, or by breathing from a gazometer. But the easiest mode is, for the patient to breathe the gas from a silk bag, to which a tube with a stop-cock is affixed.

The gases that have been employed in medicine may be considered under the divisions of those which *excite*, and those which *depress* the functions ~~of life~~. To the former order belong

Gas Oxygenium. Oxygen Gas.
Gas Oxidum Nitrosum. Nitrous Oxide Gas.

Oxygen Gas is procured from black oxide of manganese by heat. A quantity of the oxide is put into an iron retort, connected by a tube with a gas holder, or a large jar filled with water, inverted and placed on the shelf of the pneumatic trough. The retort is exposed to a full red heat; at this temperature the affinity of the oxygen to the manganese is so far weakened by the repulsive agency of the caloric, that a large portion of it is separated from the combination, and assumes the elastic form; the gas is transmitted through water, and is allowed to stand over it for some hours before it is breathed.

As oxygen is so necessary to the support of life, it might be supposed, that when afforded in a more concentrated state than that in which we breathe it in atmospheric air, it would prove a salutary agent of no inconsiderable power. To this inference, however, independent of any experience, an objection occurs, from the fact, which some experiments made by Lavoisier, and repeated by Davy, appeared to establish, that when animals are supplied with pure oxygen, or with oxygen mixed with a portion of atmospheric air, less of it is consumed than in ordinary respiration. This result appears, however, to have arisen from some fallacy in the experiments. Seguin, in subsequent trials, found that the consumption of oxygen gas, when it is breathed pure, is at least equal to its consumption in ordinary respiration. And Messrs. Allen and Pepys found that in breathing pure oxygen gas, more of it is consumed in a given time, and more carbonic acid formed, than in breathing atmospheric air. The positive action of oxygen, in the respiration of it in its undiluted form, is also shewn by the effects which result from its inspiration, and still more unequivocally by the fact ascertained by Priestly and Lavoisier, that animals confined in air, with an increased proportion of oxygen, die before it is exhausted, and even while the air which they breathe contains more oxygen than common air, so that it can enable another animal to live. It is obvious, therefore, that the animal dies not from deprivation of oxygen, but from some positive power the gas exerts, and probably, as may be inferred from some appearances which present themselves, from its too highly stimulating power.

Oxygen, when respired, acts partly by communicating a stimulating quality to the blood, by which the left side of the heart and the arterial system are excited to action: hence, when its supply by respiration is suspended, the contractions of the heart become feeble, and at length cease, as Goodwyn demonstrated.. The state of asphyxia from its abstraction, proves that it likewise exerts some other operation more immediately subservient to the functions of life; for in that state the functions of life are suspended, while the contractions of the heart continue, to a certain extent, as the experiments of Coleman shewed.

The diseases in which oxygen gas has been administered, are principally those of chronic debility,—chlorosis, asthma, scrofula, dropsy, paralysis, and some cutaneous affections. It requires to be diluted with from ten to twenty or more parts of atmospheric air, increasing the proportion of oxygen according to the effects produced. From one to two quarts of oxygen are given, by breathing it in its diluted state, at intervals, in the course of the day. It generally increases the force and velocity of the pulse.

Nitrous Oxide Gas.—This gas, a compound of oxygen and nitrogen, in the proportion of 37 of the former to 63 of the latter, is obtained, in greatest purity, from the decomposition of nitrate of ammonia by heat. When this salt is exposed to a temperature about 400° of Fahrenheit's scale, its principles re-act on each other, and enter into new combinations. The hydrogen of the ammonia attracts part of the oxygen of the nitric acid, and forms water; and the remaining oxygen combining with the nitrogen, both of the acid and of the ammonia, forms nitrous oxide, which is disengaged in the gaseous form. After its production it requires to stand some hours, to deposite a little saline vapour, before it is fit to be breathed.

The effects of nitrous oxide gas on the system, when it is respired, are scarcely analogous to those of any other agent. The excitement which is produces is extended to the functions of body and mind with more rapidity and force than that arising from the action of the most powerful stimulants. It is accompanied, too, with effects as various as they are peculiar; it excites usually a peculiar thrilling of the body, with feeling of pleasure not easily described; muscular vigour is increased, so that unusual exertions are made with alacrity and ease, and there is even strong propensity to muscular exertion; the mind is also affected: there is usually a high degree of exhilaration, yet even when this is greatest, perfect consciousness remains. What still more marks the singularity of its operation, this high excitement of the functions of life and exhilaration of mind is not followed by proportional languor or debility; the state of the system gradually returns to the healthy standard, without any apparent waste of power. A substance capable of acting in such a manner, we might suppose, would prove one of the most valuable remedies. The transient nature of its operation must undoubtedly limit its efficacy; but still, in diseases of extreme debility, we seem justified in expecting from its administration the most beneficial effects. It has not, however, been extensively employed. In paralysis it has been used with advantage. In diseases of increased sensibility, it may prove hurtful; and when breathed by delicate females, it has, in more than one case, induced hysteric affections. The dose requisite to produce its peculiar effects varies from four to nine quarts, which may be breathed pure or diluted with an equal part of atmospheric air. It cannot be breathed undiluted for more than four minutes and a half, insensibility being induced. And it requires to be attended to in its administration, that its effects are considerably different in different individuals. On some, its operation has even been productive of unpleasant consequences,—palpitation, fainting, and convulsions.

Nothing satisfactory can be said as to its mode of action, since we know so little of the connection which subsists between the phenomena of life and the chemical changes which are carried on in the system. It is absorbed by the blood when respired; but we can discover nothing connected with its composition or chemical agency which can lead to any explanation of its peculiar effects.

Under the second subdivision of the Gases,—those which depress the functions of life, might probably be placed all the substances existing in the aërial form, oxygen and nitrous oxide excepted. The following are those which have been applied to medicinal purposes.

Gas Hydrogenium. Hydrogen Gas.
Gas Nitrogenium. Nitrogen Gas.
Gas Hydrogenium Carburetum. Carburetted Hydrogen Gas.

Gas Acidum Carbonicum. Carbonic Acid Gas.
Gas Acidum Muriaticum. Muriatic Acid Gas.
Gas Acidum Nitrosum. Nitrous Acid Gas.
Gas Acidum Oxymuriaticum. Oxymuriatic Acid Gas.

Hydrogen Gas is most easily procured by the action of diluted sulphuric acid on iron or zinc; but as a little acid vapour might be diffused through it, it has been supposed preferable to obtain it, when it is designed to be breathed, by passing water in vapour over pure iron at the temperature of ignition. The iron attracts the oxygen of the water, and the hydrogen assumes the aërial form.

Hydrogen gas received into the lungs does not appear to exert any positive deleterious power; all its effects seem referable to the exclusion of oxygen. The respiration of it can accordingly be continued for some time, if it is mixed with a portion of atmospheric air, without any deleterious effect. In a pure state, however, if the lungs have been previously emptied as much as possible of atmospheric air, it can be breathed but for a very short time: it quickly occasions a giddiness and sense of suffocation; the countenance becomes livid, and the pulse sinks rapidly, and a state of insensibility is soon induced. When diluted with two-thirds or an equal part of atmospheric air, it can be safely breathed; nor does it appear to produce any very important effect. It occasions some diminution of muscular power and sensibility, and a reduction of the force of the circulation. It has been respired, diluted usually with four or five parts of atmospheric air, in catarrh, hæmoptysis, and phthisis; but its powers seem merely those of a palliative, dependent on the partial exclusion of the stimulating power of oxygen.

Nitrogen.—What has been said of hydrogen applies to nitrogen. It seems to exert no positive action on the system, but to produce any effects arising from its inspiration merely by excluding oxygen. As it is not so easily obtained pure as hydrogen gas, it has scarcely been employed.

Carburetted Hydrogen Gas.—The gas which has been used in medicine under this name is obtained by passing the vapour of water over charcoal at the temper of ignition, in an iron tube. The oxygen of the water unites with one part of the charcoal, forming carbonic acid; the hydrogen combines with another part of it, and forms this species of carburetted hydrogen. The carbonic acid is abstracted by agitating the gas in lime water.

This is the most active of those gases which operate by depressing the functions of life, and is perhaps the most powerful agent of this kind. Even when largely diluted with atmospheric air, it occasions immediate vertigo, sickness, diminution of the force and velocity of the pulse, reduction of muscular vigour, and in general every symptom of diminished power. It can scarcely be breathed in an undiluted state. Davy found, that at the third inspiration total insensibility was induced, and symptoms of extreme debility continued for a considerable time. These effects prove its positive deleterious agency.

As a medicinal agent, it is the elastic fluid of which the evidence of its efficacy was greatest. In phthisis, in many cases, it unequivocally relieved the symptoms, and arrested the progress of the disease; and in diseases of increased action or increased power, much benefit might, from its

known operation, be expected from its use. Great caution was found requisite in the trials that were made of it, with regard to the dose. At first, one pint of the carburetted hydrogen gas, diluted with twenty parts of atmospheric air, may be respired; the quantity may be slowly increased, and with less dilution, taking care to avoid the production of great vertigo or muscular debility. Not more than from two to four quarts can be taken in the day, even when the patient has been accustomed to it for some time. It is more powerful when recently prepared, than when it has been kept for some days, a circumstance requiring to be attended to in the regulation of its dose.

Carbonic Acid Gas.—This gas is easily procured from the action of diluted sulphuric or muriatic acid on carbonate of lime (chalk or marble); but to obtain it in a proper state of purity for breathing, it is preferable to decompose the carbonate of lime by exposure to a strong red heat in an iron bottle. The carbonic acid which is disengaged is collected over water, as it is not immediately largely absorbed by that fluid, and any vapour diffused through it is speedily condensed.

This acid gas, when it is inspired, proves more speedily fatal than nitrogen or hydrogen. It appears, from Davy's experiments on its respiration, to excite spasmodic contraction of the epiglottis, so as to induce suffocation; and it has this effect, even when diluted with nearly an equal part of atmospheric air. Yet the operation of it is more speedily fatal than that of any other agent that acts by occasioning merely suffocation, which would lead to the supposition that it acts by some positive power,—a supposition confirmed too by the fact, that in animals, in whom the symptoms of life have been suspended by its respiration, the irritability of the heart is entirely destroyed.

The respiration of carbonic acid gas was employed at an earlier period than that of the other gases, and sanguine expectations were formed of it as a remedy in phthisis. In the many cases, however, in which it has been tried, though it frequently proved useful for a time, by lessening the expectoration, diminishing the hectic fever, and acting as an anodyne, there is little evidence of its having ultimately effected a cure. The difficulty, indeed, in employing this and all the other gases, is that of obtaining their continued operation. In that state of disease existing in the lungs, in the earlier stages of phthisis, much advantage, for example, might probably be derived from the continued respiration of a reduced atmosphere, while little can be expected merely from its occasional operation. Carbonic acid gas, when employed, was respired diluted with four or six parts of atmospheric air. It has been found, in that irritable state of the lungs, in which cough and dyspnœa are excited from the application of cold, to be attended with considerable advantage when it is breathed in a diluted state; and an easy mode of employing it with this view, is to put a mixture of chalk or marble with diluted sulphuric acid and water into a large glass bottle, so that it shall occupy a depth only of a few inches. The carbonic acid gas is extricated, and forms an atmosphere mixed with atmospheric air in the upper part of the vessel, which may be breathed by introducing a glass tube to about the middle of the bottle, and inspiring from it.

Carbonic acid has likewise been employed as a local application to cancer and painful ulceration, and has been serviceable at least as a palliative.

A stream of it is directed on the part by means of a flexible tube, taking care to transmit the gas previously through water, if it has been obtained by the action of an acid on carbonate of lime, and confining it for some time over the sore by a funnel connected with a tube. A cataplasm, formed of substances in a state of fermentation, has a similar effect, and is more convenient in its application. A formula for this preparation has now a place in the London and Dublin Pharmacopœias, and has been already noticed.

The three last gases which I have enumerated, Nitrous Acid Gas, Muriatic Gas, and Oxymuriatic Acid Gas, require notice under this section only as having been applied to one medicinal purpose,—that of neutralizing or destroying noxious or contagious effluvia. These effluvia are probably evolved by chemical processes, and must consist of principles in forms of combination subject to chemical agency, and capable of being subverted by its exertion. It has accordingly been found, that the air of places offensive from the presence of such effluvia is corrected, and its freshness restored, by the diffusion of those acid gases, the operation of which, in changing the chemical constitution of compound elastic fluids, is most powerful.

Gas Acidum Muriaticum. Muriatic Acid Gas.

The vapours of vinegar raised by heat, and the vapours of sulphurous acid disengaged in the burning of sulphur, or the deflagration of sulphur and nitre, had long been employed as the most active means of fumigation. Dr. James Johnston, at an early period, 1758, had proposed muriatic acid, but little attention appears to have been given to the proposal. In 1773, Guyton Morveau employed it on a large scale, the use of it having been suggested to him by an hypothesis he had formed of the nature of those noxious effluvia which arise from the decomposition of animal matter. The atmosphere of the Cathedral Church at Dijon had become extremely offensive and noxious, from exhalations from cemeteries within the church; and the methods of fumigation at that time usually practised had been employed without any advantage. Morveau supposed, that the putrid odour of these effluvia must arise from the ammonia which is abundantly formed in the decomposition of animal matter, combined with a small portion of acrid oily matter formed in the same process. To neutralize this impregnation, a volatile acid, which should be capable of being easily diffused through the air, seemed to be most proper, and this led to the employment of the muriatic acid gas. A mixture of sea salt and sulphuric acid, supported over burning fuel, was placed in the body of the church, the doors being closed for twelve hours. When opened at the end of that time, the putrid odour was entirely gone. In some subsequent trials in prisons, and other situations, the same method proved equally successful. The vapour of the acid might, perhaps, by some operation similar to that which Guyton supposed, lessen or remove the putrid odour; but it can scarcely be supposed capable of destroying noxious effluvia, as, of all the acids, it is the one which, from being unable to impart oxygen, is least powerful in subverting the combination of compounds, consisting of elements such as those which must be supposed to enter into the composition of elastic fluids disengaged in the putrefaction of animal or vegetable matter. And other gases having since been employed more active in this respect, muriatic acid gas is now scarcely employed.

GAS ACIDUM OXYMURIATICUM. Oxymuriatic Acid Gas.

The process by which this gas is procured, has been already described (page 103), and its principal medicinal application, it has been stated, is by fumigation to destroy noxious or contagious effluvia. It wasapplied to this purpose by Cruickshank, from the consideration of the greater energy of its chemical action compared with that of muriatic acid gas. It changes rapidly the constitution of the greater number of the compound gases, and particularly those containing carbon and hydrogen as their elements; and though these gases may not in a pure form be evolved in the spontaneous decomposition of vegetable and animal matter, the deleterious exhalations which arise from this process must in every probability consist of elastic fluids of similar constitution; and hence there is reason *a priori* to believe, that they will be neutralized and destroyed by the oxymuriatic gas.. It has accordingly been established by Guyton's experiments, that air tainted with a putrid odour, by exposure to substances in a state of putrefaction, has this odour removed by its action; and in the subsequent applications of it to destroy deleterious and contagious effluvia, its superior power appears to have been sufficiently established.

Oxymuriatic acid gas is applied to the purpose of fumigation by disengaging it by the usual process. Four parts of muriate of soda, one of black oxide of manganese, two of sulphuric acid, and one of water, may be mixed in earthen pipkins, which, to promote the disengagement of the gas, may be placed in a sand-bath over a charcoal fire, and distributed in the apartment designed to be fumigated, the doors and windows being closed. After a few hours the air may be admitted, and ventilation established, to remove completely the vapours of the oxymuriatic gas. The only disadvantage to which it is liable is, that from its suffocating odour, the atmosphere in which it is diffused cannot be breathed, which in some situations renders it inapplicable, as requiring the removal of the sick.

GAS ACIDUM NITROSUM. Nitrous Acid Gas.

The application of nitrous acid gas to the purposes of fumigation, was principally introduced by Dr. Carmichael Smyth. In energy of chemical action it is inferior to oxymuriatic gas, and is probably, therefore, inferior to it in the power of destroying noxious or contagious effluvia. The evidence brought forward by Dr. Smyth seems to prove, however, that it has considerable activity, and that fumigation with it is successful in restoring the purity of a corrupted atmosphere; and it has the important advantage, that being free from the suffocating odour of the oxymuriatic gas, and free from its deleterious action on the lungs, fumigation with it in the wards of an hospital or ship, where the sick cannot well be removed, may be had recourse to without inconvenience. It is applied by mixing two parts of nitre in powder and one part of sulphuric acid, placing this mixture in small earthen cups in warm sand, and renewing the heat occasionally as long as any vapours continue to be exhaled. Several vessels containing a few ounces of this mixture are placed in the apartment.

ELECTRICITY,

THE medicinal operation of electricity may me referred to its stimulating power. It produces forcible contractions in the muscular fibre; excites

therefore to action, if duly applied, and, when in excess, immediately exhausts irritability. As a stimulant it possesses the important advantages of being easily brought to act locally, and of being limited to the part to which it is applied, without at all affecting the general system, while it can also be employed in every degree of force.

Electricity is applied medicinally under the form of the stream or continued discharge of the fluid, under that of sparks, and under that of a shock: the first being the most gentle, the second being more active, and the last being much more powerful than either of the others. The electric stream is applied by connecting a metallic wire, or what is better, a pointed piece of wood by a chain, with the prime conductor of the electric machine, and holding it by an insulated rod one or two inches distant from the part to which it is to be directed, while the machine is worked. An impression is felt similar to that of a current of air, and a very moderate stimulant operation is thus excited, which is better adapted to some particular cases than the more powerful spark or shock. The spark is communicated by applying a metallic knob connected with a rod in communication with the machine, the operator holding the rod by a glass handle, and bringing the knob within the distance of half an inch, an inch, or two inches, from the part to which the spark is intended to be applied: or, what some have considered as a preferable mode, the patient is placed on an insulated stool, holding a chain connected with the prime conductor, and, while the machine is worked, a metallic knob is brought by the operator within a similar distance of the part from which the spark is to be taken; a sensation somewhat pungent is excited, and slight muscular contractions may be produced; these effects being greater or less, according as the spark is more powerful, this being regulated by the distance at which the knob is held, if the machine be sufficiently in action. The shock is given by discharging the Leyden phial, making the part of the body through which it is intended to be transmitted part of the circuit, a chain for example connected with the external surface of the coated jar being applied to the shoulder, when the shock is to be sent through the arm, and the knob of the rod communicating with the inner surface of the jar being applied to the wrist. The shock is of course stronger as the phial is large, and as it is fully or partially charged; the sensation it excites is unpleasant, and the muscular contractions considerable, if it is of moderate intensity.

At the introduction of electricity as a remedy, it was highly celebrated for its efficacy in a number of diseases; its use is now confined to a few. In paralysis it is not unfrequently had recourse to, to excite muscular contraction, and perhaps with some advantage. It is usually applied under the form of sparks, the application of it requiring to be continued daily for a considerable time. Sometimes moderate shocks are also employed; but the propriety of this practice is doubtful. In amenorrhœa, as the stimulant operation can be excited, in some measure, in the vessels which are affected, advantage may be derived from electricity; and it is occasionally used, both under the form of sparks taken from the pelvis, and that of moderate shocks transmitted through it. Ophthalmia, and some other varieties of inflammation, have been removed by the electric stream; it has also succeeded in discussing tumors, and relieving pain. The general rule for the medicinal employment of electricity is to apply it at first under the milder forms, and gradually to raise it, if necessary, to the more powerful, taking care only not to employ it in too high a state of intensity, but in the greater number of cases rather to expect advantage from its

continued and moderate use. In its application to the treatment of paralysis, for example, the only rational indication is to excite moderate muscular action with the view of increasing the muscular power; to this, sparks of sufficient strength are adequate; and in employing shocks, there is some risk of exhausting the irritability of the part through which they are transmitted.

GALVANISM.

The peculiar power which is generated when two metals moistened, or acted on by certain chemical liquids, are in contact, at first named Animal Electricity, since Galvanism, has been applied as a remedy in various morbid affections. Its activity is shown by its exciting, when in sufficient intensity, sensations in sensible parts, and contractions in parts endowed with irritability, more powerful than what are exerted by any other stimulant.

Between galvanism and electricity there are so many points of resemblance, that they have been considered as the same power. There is reason to admit this conclusion. But still, from the different states in which they exist, their effects on living matter are not precisely similar. The sensation which galvanism excites, though analogous to that produced by electricity, is different; and the action of galvanism appears to be more extended, both to the nervous and muscular systems, than that of electricity, which is more local in its action. The galvanic excitation produces sensations and contractions in parts, which, from disease or temporary suspension of power, are not sensible to electrical impression; and the stimulant power which both exert, appears in galvanism to be greater in proportion to its intensity than in electricity; or the sensations and muscular contractions which the galvanic discharge excites, are more than proportioned to its power of producing electrical phenomena. Hence it is the most delicate test by which the presence of irritability can be detected.

The diseases in which galvanism has been employed, are principally those of the nervous kind. In paralysis, it has been affirmed to have restored the capability of muscular contraction, and consequently the power of motion. Cases of chorea, tetanus, and some other spasmodic affections have been related, in which cures were accomplished by its application. It appears, in several instances, to have relieved deafness, particularly that species of it arising from torpor of the auditory nerve; and it has been successful in discussing indolent tumors. The transient nature of the operation is, with regard to it, as well as electricity, an obstacle to their advantageous application; it is also more difficult to apply galvanism in a high degree of intensity, than it is to apply electricity. The former, however, has been affirmed to have succeeded in some cases in which the latter had failed; and even admitting their similarity of action, it affords a method of varying the application, which is often of importance in the protracted use of a remedy. In cases of suspended asphyxia from suspended respiration, the galvanic shock transmitted through the chest, has been found to excite powerfully, but momentarily, the action of the heart and diaphragm.

Galvanism is applied by connecting two metallic wires with the two extremities of a galvanic battery, and bringing them in contact with the part affected, so that it shall form part of the circuit of the galvanic dis-

charge; the one wire is kept in contact with the part it touches; the other is alternately applied for a moment, and removed, and this is continued for some time. If the skin is moistened. the galvanic influence is communicated more readily and effectually; and still more so if a small piece of metallic leaf, as tinfoil, be laid on the parts to which the wires are applied. Sometimes even the cuticle has been removed by a blister, but the application of the galvanism is then attended with pain, and this is unnecessary, if a galvanic apparatus of sufficient power be employed. One constructed of plates of zinc and copper, four inches square, and including from 25 to 50 of each metal, is sufficient for the greater number of purposes, a greater or less number of the plates being included in the circuit, according to the strength of the application required. The liquid best adapted to excite it is a solution of muriate of soda, with a little muriatic acid; diluted nitric acid, though more powerful, having its power sooner exhausted, and its action being attended with a disengagement of nitrous gas.

OF MEDICAL PRESCRIPTIONS.

The principal objects designed to be attained by the Composition of Medicines are, to communicate an agreeable taste or flavour; to give a convenient form; to correct the operation of the principal medicine, or obviate some unpleasant symptom it is liable to produce; to promote its action by the substance combined with it exerting one of a similar kind; to obtain the joint operation of remedies, which have different powers, but which may be required to obviate different morbid symptoms present together; or, lastly, to change the usual effects of the substances mixed, and obtain a remedy different from either, by the power which one may have of modifying the action of another. Some of these effects are highly important, and establish the propriety of conjoining medicines in one formula.

A prescription has been usually divided into four parts, which compose it,—the *basis*, or principal ingredient of the prescription; the *adjuvans*, or that which is designed to promote the action of the former; the *corrigens*, or that intended to correct its operation, or obviate any unpleasant symptom which it may be apt to produce; and the *constituens*, or the substance which gives to the other ingredients consistence or form. All these are not necessarily present in every formula, as some of these purposes may not require to be attained; nor is the division itself of much importance, except that it affords perhaps the best general rule for regulating the order in which the ingredients of a prescription should be enumerated, the order being conformable to that which corresponds with this arrangement.

The following are the principal circumstances to be attended to in forming a prescription; and the observations of which may guard against the errors liable to be committed in the composition of medicines.

1st, Simplicity is to be attained, so far as is consistent with the objects of the prescription. Nothing ought to enter into the composition which does not add to its virtue, render it less ungrateful, give it a convenient form, or which is not necessary to conceal any particular ingredient; and, in general, the practice of accumulating a number of articles in one prescription is to be avoided, as there is always the risk of one counteracting or modifying the action of another; at least the addition of

less active substances can do little more than add to the bulk of the principal medicine, or cause it to sit uneasy on the stomach.

2dly, Substances, it is evident, ought not to be mixed together, which are capable of entering into chemical combination, or of decomposing each other, unless it be with the view of obtaining the product of the combination, or decomposition, as a remedy. Errors with regard to this are most likely to occur in mixing together saline and metallic preparations.

3dly, Those mixtures are also to be avoided in which one medicine, by its peculiar action on the stomach or general system, modifies and changes the action usually exerted by another, unless where the object is to obtain the effects of that modified operation.

4thly, The error of contra-indication is to be guarded against, or those medicines ought not to be combined, the virtues of which are not merely different, but are, in some measure, opposed to each other,—an error not very likely to occur with regard to the principal ingredients of a prescription, but which may happen sometimes to a less extent with regard to those of inferior importance.

5thly, The ingredients which are to be combined, must be such as will mix properly together, so that the form in which the remedy is designed to be exhibited may be easily obtained and preserved.

Lastly, The form under which a medicine is prescribed must be adapted to certain circumstances; principally to the nature of the disease, the nature of the remedy itself, and, as far as can be conveniently attained, to the taste of the patient. Those medicines which are nauseous, which operate in a small dose, or are designed to operate slowly, or which have a considerable specific gravity, are usually given under the form of pill, or sometimes of bolus. Those which are less ungrateful, or the operation of which is designed to be immediately obtained, are given in the form of electuary, or under some liquid form. Tinctures always require to be diluted: infusions or decoctions may in general be given in the state in which they are prepared. These last are always of extemporaneous preparation, as they cannot be preserved long uninjured, and the proper application of them must depend on the chemical properties, and chiefly on the solubility in the menstruum of the active principles of the substance submitted to preparation.

The Doses of Medicines are not reducible to any general rules, from their general similarity of operation, or any other circumstance, and are therefore specific with regard to each substance. But there are certain general circumstances by which their operation is influenced, which require to be attended to in apportioning the dose. The most important of these are, Age, Sex, Temperament, Idiosyncrasy, Habit, and Disease.

Age,—From infancy to manhood, a larger dose of any medicine is requisite to produce its effect, in proportion to the advance in life. From manhood to old age, it has been supposed, that there is a similar gradation with regard to diminution of dose; but this is undoubtedly in a less proportion than that which regulates the increase. The following table by Gaubius has been supposed to shew these proportions, with regard to the early period of life in which the necessity for the diminution of dose is unquestionable.

Let the dose for a person of middle age be	1	or 1 drachm.
For one from xiv to xxi years, it will be	$\frac{2}{3}$	or 2 scruples.
——————vii to xiv	$\frac{1}{2}$	or half a drachm.
——————iv to vii	$\frac{1}{3}$	or 1 scruple.
————of iv years of age	$\frac{1}{4}$	or 15 grains.
———— iii ————.	$\frac{1}{6}$	or half a scruple.
———— ii ————.	$\frac{1}{8}$	or 8 grains.
———— i ————.	$\frac{1}{12}$	or 5 grains.

Sex.—Women, in general, require rather smaller doses of any active medicine than men,—a difference which is probably owing principally to their greater sensibility from their habits of life.

Temperament.—By temperament is understood a predisposition, derived from original conformation, to be affected in a peculiar manner by external causes acting on the system; and much laborious investigation has been bestowed in distinguishing the different temperaments, and the diversities to which they give rise. With regard to their influence in the operation of medicines, those of the sanguine temperament are supposed to be more easily affected, and therefore to require smaller doses than those of the phlegmatic or melancholic. In what has been said, however, on this subject, there is so much uncertainty and hypothesis, that little reliance can be placed on it.

Idiosyncrasy.—This denotes that disposition in individuals, unconnected with general temperament, to be affected by certain causes, in a manner different from the generality of mankind. Such idiosyncrasies exist with regard to medicines, as well as to other agents, and where they are known, they may require to be attended to by the prescriber.

Habit.—This has an important influence on the operation of medicines. In general, it diminishes the effect resulting from the action of external powers on the system; hence medicines often lose part of their power by their administration having been long continued, and the doses of them therefore require to be enlarged under their protracted use. This is particularly the case with stimulants and narcotics, and is even observed, to a certain extent, in some of the other classes of the Materia Medica. In a few instances, the reverse has been supposed to hold true, particularly with regard to emetics and saline cathartics.

Disease.—This has an influence on the doses of medicines not less important; the susceptibility to external impressions, and to action, being much varied in morbid affections, and the operations of remedies of course being modified by such variations. The state of susceptibility being in general apparent, when it varies much from the healthy standard, the doses of the medicines administered are regulated accordingly, and this, it is obvious, admits of no general observations, as being entirely dependent on the nature and state of disease.

The following Table shews the doses of the principal medicines, employed in modern practice, adapted to the prime of life, and independent of any peculiarities,—and requiring, therefore, in particular cases, to be modified according to the influence of the preceding circumstances.

TABLE OF THE DOSES OF MEDICINES.

ACETAS ammoniae, uncia dimidia—una.
hydrargyri, granum unum—grana quinque.
kali, scrupulus—semidrachma.
plumbi, granum dimidium—grana tria.
potassae, drachma dimidia—drachma una.
Acetatis ferri tinctura, guttae decem—triginta.
cum alcohole, minima decem—drachma.
ammoniae aqua, drachmae duae—uncia dimidia.
Acetum colchici, drachma una.
Acidum aceticum scilliticum, drachma dimidia—drachma una.
citricum scilliticum, grana decem—semidrachma
muriaticum, guttae viginti—triginta.
nitricum, drachma dimidia.
sulphuricum aromaticum, guttae viginti—triginta.
dilutum, guttae viginta.
Aconitum napellus, grana duo.
Æther nitrosus, drachma dimidia.
sulphuricus, drachma dimidia.
cum alcohole, semidrachma—drachmae duae.
aromaticus, semidrachma—drachmae duae.
Æthiops mineralis, grana decem.
Alcohol ammoniatum, semidrachma—drachma.
aromaticum, guttae viginta—triginta.
foetidum, drachma dimidia.
succinatum, guttae decem—quadraginta.
Allium sativum, drachma una.
Aloe perfoliata, grana decem.
Alumen, grana quinque—decem.
Ammoniacum, grana decem—scrupulus.
Ammoniae aqua, guttae quinque—decem.
Ammoniae aqua diluta, guttae quindecim—semidrachma.
hydrosulphuretum, guttae quinque—decem.
murias, grana decem—semidrachma.
subcarbonas, grana quinque—decem.
subcarbonatis solutio, guttae decem—drachma.
Ammoniaretum cupri, granum dimidium—granum unum.
Amomi repentis pulvis, grana quinque—scrupulus.
Amomum zingiber, grana decem—drachma dimidia.
Anthemis nobilis, drachma dimidia.
Anthemidis nobilis extractum, grana decem—semidrachma.
infusum, semiuncia—unciae duae.
oleum, guttae quinque—decem.
Antimonii oxidum cum phosphate calcis, grana quinque—decem.
sulphuretum, grana quinque—quadraginta.
praecipitatum, grana duo—grana quinque.
tartras, granum dimidium—grana tria.
tartratis vinum, drachmae duae—tres.
Aqua acetatis ammoniae, uncia dimidia—uncia una.
ammoniae, guttae quindecim—triginta.
calcis, libra in dies.
carbonatis ammoniae, drachma dimidia.
potassae, drachma dimidia.
supercarbonatis potassae, librae duo in dies.
supercarbonatis sodae, librae duo in dies.
Arbutus uva ursi, scrupulus—drachma dimidia.
Argenti nitras, grani pars octava—quarta.
Aristolochia serpentaria, drachma dimidia.
Arnica montana, grana duo—quinque.
Arsenici solutio, guttae quatuor ter in dies.
Artemisia santonica, scrupulus—drachma dimidia.
Assa foetida, grana decem—scrupulus.
Atropa belladona, granum unum.
Balsamum copaibae, drachma dimidia.
Peruvianum, grana decem.
Tolutanum, grana quindecim—quadraginta
Belladona, granum unum.
Bonplandia trifoliata, drachma dimidia.
Bonplandiae trifoliatae infusum, uncia dimidia—unciae duae.
tinctura, drachma dimidia—drachma.
Bubon galbanum, drachma dimidia.
Callicocca ipecacuanha, grana quindecim.
Cancrorum chelae, drachma una.
lapilli, drachma una.
Calomelas granum—grana decem.
Calumba, grana decem—viginti.
Camphora, grana quinque—scrupulus.
Cantharis, granum unum.
Carbonas ammoniae, scrupulus—drachma dimidia.
calcis praeparatus, drachma una.
ferri praecipitatus, grana decem.
praeparatus, grana decem—scrupulus.
magnesiae, drachma dimidia.
potassae, grana decem.
sodae, grana decem.
Cascarilla, drachma dimidia.
Castoreum, scrupulus—drachma dimidia.
Catechu, grana decem—scrupulus.
Cicuta, grana tria.
Cinchona Caribaea, drachma dimidia.
oblongifolia, drachma dimidia.
cordifolia, drachma dimidia.
lancifolia, drachma dimidia.
Colchicum autumnale, granum unum—quinque.
Colocynthis, grana duo—quinque.
Colombo, scrupulus.
Conium maculatum, grana tria.
Contrayerva, scrupulus.
Convolvulus jalapa, drachma dimidia.
scammonia, grana tria—quinque.
Copaiva, drachma dimidia.
Cortex Peruvianus, drachma dimidia.
Cremor tartari, uncia dimidia—uncia una.
Creta praeparata, drachma una.
Crocus, grana quinque—semidrachma.
Crotonis eleutheriae cortex, drachma dimidia.
Cupri ammoniaretum, grana dimidia—granum unum.
sulphas, grani pars quarta—grana duo.
Cusparia febrifuga, drachma dimidia.
Daphnes mezerei decoctum, uncia—unciae duae.
Daturae stramonii herba, granum—grana octo.
Decoctum aloes, unciae duae.
compositum, semuncia—unciae duae.
cinchona officinalis, unciae quater ter in dies.
daphnes mezerei, libra in dies.
digitalis, uncia una.
dulcamarae, semuncia—uncia.
geoffraeae inermis, unciae duae.
guaiaci compositum, librae duae in dies.
lichenis islandici, drachmae quatuor—unciae duae.
polygalae senegae, uncia—unciae tres.
sarsaparillae compositum, librae duae in dies.
sarsaparillae, librae duae in dies.
ulmi campestris, unciae quatuor—libra.
Digitalis purpurea, granum unum.
Dolichos pruriens, grana quinque—decem.
Dorstenia contrayerva, drachma dimidia.
Elaterium, granum unum.
Electuarium cassiae sennae, uncia una.
catechu compositum, drachma dimidia.
cassiae fistulae, uncia una.
opiatum, drachma dimidia.
sennae compositum, semidrachma—semuncia.

Elixir sacrum, drachmae sex.
Emulsio acaciae Arabicae, ad libitum.
amygdali communis, librae duae in dies.
camphorae, unciae quater in dies.
Extractum anthemidis nobilis, grana decem—scrupulus.
aloes, grana quinque—decem.
cascarillae, scrupulus.
chamaemeli, grana decem—scrupulus.
cinchonae, grana decem.
colocynthidis compositum, grana quinque.
convolvuli jalapae, grana decem.
corticis Peruviani, grana decem.
elaterii, granum dimidium.
foliorum sabinae, grana decem—triginta.
gentianae luteae, grana decem—triginta.
hellebori nigri, grana decem.
haematoxyli Campechensis, grana decem—scrupulus.
humuli, grana quinque—quindecim.
jalapae, grana decem.
opii, granum unum—duo.
papaveris, grana duo—scrupulus.
rhei, grana decem—drachma dimidia.
rutae graveolentis, grana decem—scrupulus.
sarsaparillae, grana decem—drachma.
taraxaci, grana decem, drachma.
valeriana, grana decem—scrupulus.
Ferri acetatis tinctura, guttae decem—triginta.
alkalini liquor, drachma dimidia—drachma cum semisse.
ammoniati tinctura.
et ammoniae murias, grana tria—quindecim.
carbonas, grana decem—drachma dimidia.
limatura purificata, drachma una.
muriatis tinctura, guttae decem—viginti.
muriatis et ammoniae, tinctura grana decem—viginti
oxidum nigrum purificatum, grana tria—decem.
subcarbonas, grana quatuor—viginti.
sulphas, granum unum—grana duo.
tartarus, grana duo—decem.
vinum, drachma—drachmae tres.
Ferulae assafoetidae, gummi resina, grana decem—drachma dimidia.
Ferrum ammoniatum, grana quinque.
Galbanum, scrupulus—drachma dimidia.
Gambogia, grana quinque.
Guaiacum officinale, grana decem—scrupulus.
Hydrargyrus calcinatus, granum unum.
cum creta, grana duo—decem.
magnesia, grana duo—decem.
Hydrargyri acetas, grana duo.
murias mitis, granum unum—grana decem
murias corrosivus, granum dimidium in dies.
muriatis liquor, drachma—drachmae duae.
oxidum rubrum, granum dimidium—grana duo.
oxidum cinereum, granum unum—grana duo.
submurias praecipitatus, granum—grana quinque.
subsulphas flavus, granum—grana quinque.
sulphuretum nigrum, scrupulus—scrupuli duo.
rubrum, grana decem—scrupulus.
Hydrosulphuretum ammoniae, guttae quinque—decem.
Hyosciamus niger, granum unum—grana duo.
Infusum acaciae catechu, uncia—tertia quaque hora.
amarum, unciae duae bis terve in dies.
anthemidis, unciae tres bis in dies.
armoraciae compositum, uncia—unciae tres
aurantii compositum, uncia cum semisse—unciae tres.
columbae, uncia duae.
Infusum caryophyllorum, uncia una.
cascarillae, unciae duae.
cassiae sennae, uncia—unciae quatuor.
cuspariae, unciae duae.
cinchonae officinalis, unciae duae.
digitalis purpureae, uncia una bis in dies.
gentianae compositum, unciae duae bis terve in dies
lini, librae duae in dies.
menthae compositum, uncia—unciae tres subinde.
quassiae, uncia—unciae sex, bis in dies.
quassiae excelsae, unciae duae.
rhei palmati, unciae duae—quatuor.
sennae cum tamarindis, uncia—unciae duao.
compositum, uncia—unciae duae.
simaroubae, unciae duae.
valerianae, unciae duae.
Ipecacuanha, grana quindecim.
Jalapa, drachma dimidia.
Kino, grana decem—scrupulus.
Lac ammoniaci, uncia una.
Lactuca sativa, grana tria—quinque.
virosa, grana duo.
Laudanum liquidum, guttae viginti quinque.
Liquor arsenicalis guttae quater ter in dies.
antimonii tartarizati, uncia dimidia—uncia una.
ferri alkalini, guttae decem ter quaterve in dies.
hydrargyri oxymuriatis, drachma una—duo.
Lixivium causticum, guttae viginti bis in dies.
Magnesia, scrupulus unus.
Manna, uncia una.
Mel scillae, drachma una—drachmae duo.
Meloë vesicatorius, granum unum.
Mistura ammoniaci, uncia una bis terve in dies.
assafœtidae, uncia una bis terve in dies.
ferri composita, uncia bis in dies
hydrargyri corrosivus, granum dimidium in dies.
guaiaci, uncia bis in dies.
camphorae, unciae duae.
moschi, uncia dimidia—unciae duae.
Moschus, grana decem—scrupulus.
Murias ammoniae et ferri, grana quinque.
Myrrha, drana decem—scrupulus.
Nitras argenti, grani pars octava—grana duo.
Nitrum, grana decem—scrupulus.
Oleum lini usitatissimi, uncia dimidia—uncia.
ricini, uncia una.
volatile anisi, guttae quinque—decem.
carui, guttae quinque.
juniperi communis, guttae quinque.
menthae piperitae, guttae duae—quinque.
Opium, granum unum.
Oxidum antimonii cum phosphate calcis, grana quinque—decem.
hydrargyri cinereum, granum unum—grana duo.
zinci, grana duo—quinque.
Oxymel scillae, drachma una—drachmae duac.
Oxymurias potassae, grana decem bis in dies.
Phosphas sodae, uncia una.
Pilulae aloes cum zingibere, grana quinque—quindecim.
aloeticae, grana decem.
et assafoetidae, grana decem.
colocynthidis, grana quinque—decem.
myrrhae, grana decem.
ammoniareti cupri, pilula una mane et vespere.
assafoetidae compositae, grana decem.
galbani compositae, grana decem.
hydrargyri, pilula una ter in dies.
myrrhae compositae, grana decem.
opiatae, grana quinque—decem.
rhei compositae, grana decem.
scillae, grana decem.
saponis cum opio, grana quinque
e styrace, grana quinque.
gambogiae, grana decem.

Pilulae ferri cum myrrha, grana quinque—decem.
hydrargyri submuriatis, pilula una mane et vespere.
Pulvis aloes compositus, grana decem—quindecim.
antimonialis, grana quinque—decem.
aromaticus, grana quinque—decem.
carbonatis calcis compositus, drachma una.
cretae compositus, drachma dimidia.
cum opio, scropulus, drachma dimidia.
contrayervae compositus, drachma dimidia.
cornu usti cum opio, grana decem.
doveri, grana decem—scrupulus.
ipecacuanhae et opii, grana decem—scrupulus.
jalapae compositus, drachma dimidia—drachma una.
opiatus, grana decem.
salinus compositus, drachmae tres—unciae.
scammonii compositus, grana decem.
Rheum palmatum, scrupulus—drachma dimidia.
Rhus toxicodendron, granum unum.
Rubia tinctorum, drachma dimidia.
Rubigo ferri præparata, grana decem—triginta.
Sagapenum, grana decem—viginti.
Santonicum, drachma dimidia.
Scammonium, grana quinque—decem.
Scilla exsiccata, granum unum—grana duo.
Serpentaria virginiana, scrupulus—drachma dimidia.
Sinapis alba, uncia dimidia.
Solutio muriatis barytae, guttae decem bis in dies.
muriatis calcis, guttae viginti.
Spiritus aetheris nitrosi, drachma dimidia.
aetheris sulphurici, drachma dimidia.
ammoniae, drachma dimidia.
aromaticus, drachma dimidia.
foetidus, drachma dimidia.
anisi, uncia dimidia.
lavandulae compositus, drachma dimidia—drachma una.
nitri dulcis, drachma dimidia.
Stannum, drachma dimidia—drachmae duae.
Succus spissatus aconiti napelli, granum unum.
atropae belladonae, granum unum.
conii maculati, grana duo.
hyoscyami nigri, granum unum—grana duo.
lactucae virosae, grana quinque.
momordicae elaterii, granum unum.
sambuci nigrae, drachma dimidia—uncia.
Sulphas cupri, granum unum—grana duo.
ferri, granum unum—grana quinque.
magnesiae, uncia una—unciae duae.
potassae, drachma una—drachmae duae.
sodae, uncia una—unciae duae.
zinci, grana quinque—decem.
Sulphur, drachmae duae—uncia dimidia.
Sulphuretum antimonii praeparatum, grana decem—drachma dimidia.
praecipitatum, grana quinque.
hydrargyri nigrum, grana decem.
potassae, grana decem—viginti.
Supersulphas aluminae et potassae, grana quinque—decem.
Supertartras potassae, uncia dimidia.—uncia una.
Swietenia febrifuga, drachma dimidia.
mahagoni, drachma dimidia.
Syrupus colchici autumnalis, uncia dimidia.
opii, uncia una.
papaveris somniferi, uncia una.
rhamni cathartici, uncia una.
scillae maritimae drachmae duae—uncia dimidia.
sennae, drachmae una.
Tartarus emeticus, granum unum.
Tartarum solubile, uncia una.
Tartras antimonii, granum unum.
potassae, uncia una.
et sodae, uncia una.
Tinctura acaciae catechu, drachma una.
aloes aetherea, drachma una mane et vespere.
aloes, drachmae duae.
angusturae, drachmae duae.
assaefoetidae, drachma una.
Bonplandiae trifoliatae, drachma dimidia—drachma.
camphorae composita, drachmae duae—uncia dimidia,
cantharidum, guttae quindecim.
castorei, drachma una.
castorei composita, drachma dimidia.
catechu, drachma una.
cinchonae lancifoliae, drachmae duae.
composita, drachma una—drachmae duae.
colombae, drachmae duae.
convolvuli jalapae, uncia dimidia.
conii maculati, drachma dimidia—drachma.
crotonis eleutheriae, drachma—drachmae tres.
digitalis purpureae, guttae decem—quindecim.
ferri acetatis, drachma dimidia.
ferri ammoniati, drachma dimidia.
ferri muriatis, guttae decem—viginti.
ferulae assaefoetidae, drachma.
gentianae composita, drachmae duae.
guaiaci, drachmae duae.
ammoniata, drachma.
hellebori nigri, drachma una.
humuli, drachma dimidia—drachma una.
hyoscyami nigri, drachma dimidia.
jalapae, drachmae duae.
japonica, drachma una.
kino, drachma una.
meloes vesicatorii, guttae quindecim.
muriatis ferri cum oxido rubro, minima decem—drachma.
opii, guttae viginti quinque.
opii ammoniata, drachma dimidia—drachma una.
opii camphorata, drachmae duae—uncia dimidia.
quassiae, drachmae duae.
rhei palmati, uncia dimidia—uncia una.
rhei et aloes, uncia dimidia—uncia una.
rhei composita, uncia una.
scillae, drachma dimidia.
sennae, uncia una.
valerianae ammoniata, drachma dimidia.
veratri albi, guttae quinque.
Trochisci glycyrrhizae cum opio, drachma in dies.
Uva ursa, scrupulus—drachma dimidia.
Valeriana officinalis, scrupulus unus—drachma una.
Vinum aloes socotorinae, uncia una.
antimoniale, drachmae duae—sex.
antimonii tartarizati, drachmae duae—uncia dimidia.
ferri, drachma—drachmae duae.
gentianae compositum, uncia dimidia.
ipecacuanhae, uncia dimidia—uncia una.
nicotianae tabaci, guttae viginti bis in dies.
rhei palmati, uncia una.
Zinci oxidum, grana duo—quinque.
sulphas, grana quinque—decem.
Zingiber, grana decem—scrupulus unus.

The following Tables are given by the Colleges to show the proportions of Opium, and of certain preparations of Antimony, Quicksilver, Arsenic, and Iron, in compound medicines containing them, according to their respective Pharmacopœias. The first is the Table referring to the Edinburgh—the second, that referring to the London,—and the third, that referring to the Dublin Pharmacopœia.

TABLE I.

Vinum Tartratis Antimonii, in singulis unciis habet Tartratis Antimonii, olim Tartari emetici, grana duo.
Tinctura Opii, olim *Laudanum Liquidum*, fit cum Opii scrupulis duobus in singulis unciis liquidi, sive cum granis quinque in singulis drachmis. Tincturae autem drachma ut liquoris evaporatione constat, continet Opii grana circiter tria cum semisse.
Tinctura Opii Camphorata, vulgo *Elixir Paregoricum Anglorum*, fit cum Opii granis doubus in singulis unciis liquidi.
Tinctura Opii Ammoniata, olim *Elixir Paregoricum*, fit cum Opii granis circiter octo in singulis unciis liquidi; sive cum grano fere uno in singulis drachmis.
Tinctura Saponis et Opii, vulgo *Linimentum Anodynum*, fit cum Opii scrupulo uno in singulis unciis liquidi.
Pulvis Ipecacuhanæ et Opii, olim *Pulvis Doveri*, in singulis drachmis habet Opii grana sex, sive in granis decem, Opii granum unum.
Electuarium Catechu Compositum, olim *Confectio Japonica*, in singulis unciis habet Opii grana circiter duo cum semisse: In granis enim centum et nonaginta tribus, habet Opii granum unum.
Electuarium Opiatum, olim *Thebaicum*, in singulis drachmis habet Opii granum fere unum cum semisse.
Pilulæ Hydrargyri, in singulis drachmis habent Hydrargyri grana quindecim. Singulae pilulae habent Hydrargyri granum unum
Pilulæ Opiatæ, olim *Thebaicæ*, in singulis drachmis habent Opii grana sex. Pilula granorum quinque, habet Opii granum dimidium.
Trochisci Glycyrrhizæ Cum Opio, in singulis drachmis habent Opii granum fere unum.
Unguentum Nitratis Hydrargyri Fortius, vulgo *Unguentum Citrinum*, in singulis drachmis habet Hydrargyri grana quatuor, Acidi Nitrosi grana octo.
Unguentum Nitratis Hydrargyri Mitius, in singulis scrupulis habet Hydrargyri granum dimidium, Acidi Nitrosi granum unum.
Unguentum Hydrargyri, in singulis drachmis habet Hydrargyri grana duo decim; cum duplice Hydrargyro, drachma habet grana viginti quatuor.
Unguentum Oxidi Hydrargyri Cinerei, in singulis drachmis habet Oxidi grana quindecim.
Unguentum Oxidi Hydrargyri Rubri, in singulis drachmis, oxidi grana septem habet.
Emplastrum Hydrargyri, in singulis drachmis habet Hydrargyri grana circiter sexdecim.

TABLE II.

Confectio Opii in granis circiter sex et triginta continet Opii granum.
Hydrargyrum Cum Creta in granis circiter tribus continet Hydrargyri granum.
Liquor Antimonii Tartarizati in fluidrachmis quatuor continet Antimonii Tartarizati granum.
Liquor Arsenicalis in fluidrachmis duabus continet Oxydi Arsenici granum.
Liquor Hydrargyri Oxymuriatis in fluidunciis duabus continet Hydrargyri Oxymuriatis granum.
Pilulæ Hydrargyri in granis tribus continent Hydrargyri granum.
Pilulæ Hydrargyri Submuriatis in granis circiter quatuor continent Hydrargyri Submuriatis granum.
Pilulæ Saponis Cum Opio in granis quinque continent Opii granum.
Pulvis Cornu Usti Cum Opio in granis decem continet Opii granum.
Pulvis Cretæ Compositus Cum Opio in scrupulis duobus continet Opii granum.
Pulvis Ipecacuanhæ Compositus in granis decem continet Opii granum.
Pulvis Kino Compositus in scrupulo continet Opii granum.
Unguentum Hydrargyri Fortius in drachmis duabus continet Hydrargyri drachmam.
Unguentum Hydrargyri Mitius in drachmis sex continet Hydrargyri drachmam.

TABLE III.

Pulvis Ipecacuanhæ Compositus in granis decem continet Opii granum.
Syrupus Opii, in *mensura* unciali, continet extracti Opii Aquosi granum circiter; liquor enim, ex adjecto saccharo, crescit in molem plus quam duplicem.
Tinctura Opii in *mensura* drachmae continet opii purificati grana quatuor cum semisse circiter.
Tinctura Opii Camphorata in *mensura* drachmarum quatuor cum semisse continet Opii purificati granum unum quamproxime.
Electuarium Catechu Compositum in singulis unciis continet Opii purificati grana duo cum semisse circiter.
Pilulæ Hydrargyri in granis sex continent Hydrargyri grana duo.
Pilulæ Styrace, in granis quinque massae continent Opii purificati granum unum.
Hydrargyrus Cum Magnesia grana tria continent Hydrargyri drachmam unum.
Unguentum Hydrargyri Fortius, in drachmis duabus continet Hydrargyri drachmam unum.
Tinctura Acetatis Ferri Cum Alcohol in *mensura* drachmae continet Acetatis Ferri siccati granum circiter.

TABLE OF CHANGED NAMES IN THE NEW EDINBURGH AND LONDON PHARMACOPŒIAS.

Old Names.	*Names in the Edin. Pharm.*	*Names in the Lond. Pharm.*
Absinthium	Artemisia absinthium	Absinthium
Acetis hydrargyri	Acetas hydrargyri	
plumbi	plumbi	
potassæ	potassæ	
Acetosa	Rumex acetosa	Acetosa
Acetum aromaticum	Acidum aceticum aromaticum	
scillæ maritimæ	scilliticum	
vini	Acetum	
Acidum acetosum	Acetum	
camphoratum	Acidum aceticum camphoratum	
destillatum	tenue	Acidum Aceticum
forte	forte	
nitrosum		nitricum
vitriolicum	sulphuricum	sulphuricum
vitrioli aromaticum	aromaticum	
Ærugo	Sub-acctas cupri	
Æther vitriolicus	Æther sulphuricus	
Æthiops mineralis	Sulphuretum hydrargyri nigrum	
Agaricus	Boletus igniarius	
Alcohol	Alcohol fortius	
dilutum	dilutius	
ammoniatum aromaticum	Tinctura aromatica ammoniata	
ammoniatum fœtidum	assæfœtidæ ammoniata	
Alkali causticum	Potassa	
fixum fossile	Subcarbonas sodæ	
vegetabile	potassæ imrus	
volatile	ammoniæ	
Aloë Barbadensis		Aloës vulgaris extractum
socotorina		spicatae extractum
Ammonia muriata	Murias ammoniæ	
præparata	Subcarbonas ammoniæ	Ammoniae subcarbonas
Angelica sativa	Angelica Archangelica	
Angustura	Bonplandia trifoliata	
Anisum	Pimpinella anisum	
Antimonium	Sulphuretum antimonii	Antimonii sulphuretum
calcareo phosphoratum	Oxidum antimonii cum phosphate calcis	
tartarizatum	Tartras antimonii	
Aqua ammoniæ acetatæ	Aqua acetatis ammoniæ	Liquor ammoniae acetatis
causticæ	Aqua ammoniæ	Liquor ammoniae
aluminis composita		Liquor aluminis compositus
calcis	Solutio calcis	Liquor calcis
carbonatis ammoniæ	Solutio subcarbonatis ammoniæ	
cupri ammoniati		Liquor cupri ammoniati
cupri vitriolati composita, *vel* aqua styptica	Solutio sulphatis cupri composita	
lithargyri acetati		plumbi subacetatis
composita		plumbi subacetatis dilutus
lixivia caustica	Aqua potassæ	potassae
zinci vitriolati	Solutio sulphatis zinci	
Arabicum gummi	Gummi acaciæ Arabicæ	Acaciae gummi
Argentum nitratum	Nitras argenti	Argenti nitras
vivum	Hydrargyrus	
Arsenicum	Oxidum arsenici	
Assafœtida	Gummi-resina ferula assæfœtidæ	
Aurantium Hispalense	Citrus aurantium	
Axungia porcina	Adeps suillus	
Balsamum Canadense	Resina liquida pini balsameæ	Terebinthina Canadensis
Copaibæ	copaiferæ officinalis	Copaiba

Old Names.	*Names in the Edin. Pharm.*	*Names in the Lond. Pharm.*
Gileadense	Resina liquida amyridis Gileadensis	
Balsamum Peruviauum	Balsamum myroxyli peruiferi	
Tolutanum	toluiferae balsami	
traumaticum	Tinctura benzoini composita	
Bardana	Arctium lappa	
Barilla	Subcarbonas sodae impurus	Soda impura
Barytes	Carbonas barytae	
Belladonna	Atropa belladonna	
Benzoinum	Balsamum styracis benzoini	Benzoinum
Bistorta	Polygonum bistorta	
Borax	Sub-boras sodae	Sodae sub-boras
Cajeputa	Melaleuca leucadendron	
Calamus aromaticus	Acorus calamus	Calami radix
Calomelas	Submurias hydrargyri mitis	Hydrargyri submurias
Calx viva	Calx	
cum kali puro		Potassae cum calce
hydrargyri alba		Hydrargyrum praecipitatum album
Cancrorum lapilli	Carbonas calcis durior	
Canella alba		Canellae cortex
Cantharis	Cantbaris vesicatoria	Lytta
Cardamomum minus	Amomum repens	
Carduus benedictus	Centaurea benedicta	
Carica	Fructus fici caricae	
Carvi	Carum carui	
Carbonas ammoniae	Subcarbonas ammoniae	
potassae	potassae	
sodae	sodae	
ferri praeparatus	ferri praeparatus	
Caryophyllus aromaticus	Eugenia caryopbyllata	Caryophylli
Caryopbylla rubra	Dianthus caryophyllus	
Cascarilla	Croton eleutheria	
Cassia fistularis	Cassia fistula	Cassiae pulpa
lignea	Laurus cassia	
Castoreum rossicum		Castoreum
Catechu	Acacia catechu	
Causticum commune acerrimum	Potassa	
mitius	cum calce	
lunare	Nitras argenti	
Centaurium minus	Chironia centaurium	
Ceratum lithargyri acetati compositum		Ceratum plumbi compositum
Cerussa	Carbonas plumbi	Plumbi subcarbonas
acetata	Acetas plumbi	superacetas
Chamaemelum	Antbemis nobilis	Antbemidis flores
Cicuta	Conium maculatum	Conii folia
Cinnabaris factitia	Sulphuretum hydrargyri rubrum	
Cinchona officinalis, vulgo cortex Peruvianus *a.* communis	Cinchona lancifolia	Cinchonae lancifoliae cortex
b. flavus	cordifolia	cordifoliae cortex
c. ruber	longifolia	oblongifoliae cortex
Cineres clavellati	-	Potassa impura
Cinnamomum	Laurus cinnamomum	
Coccinella	Coccus cacti	Coccus
Colocynthis	Cucumis colocynthis	
Colomba		Calumbae radix
Confectio Japonica	Electuarium catechu compositum	
opiata		Confectio opii
Conserva aurantii		aurantiorum
cynosbati		rosae caninae
rosae		rosae Gallicae
Contrajerva	Dorstenia contrajerva	
Cortex angusturae		Cuspariae cortex
Cortex Peruvianus	Cortex cinchonae	
Creta alba	Carbonas calcis mollior	
Crystalli tartari	Supertartras potassæ	
Cucumis agrestis	Momordica elaterium	Elaterii poma
Cuprum ammoniacum	Ammoniaretum cupri	
vitriolatum	Sulpbas cupri	
Cydonia malus, *semen*		Cydoniae semina
Cynosbatus	Fructus rosae caninae	Rosae caninae pulpa
Daucus sylvestris	Daucus carota	
Decoctum Chamaemeli vel commune	Decoctum anthemidis nobilis	

Old Names.	*Names in the Edin. Pharm.*	*Names in the Lond. Pharm.*
Decoctum cinchonæ officinalis	Decoctum cinchonae lancifoliae	
lignorum	guaiaci compositum	
pro enemate	-	Decoctum malvæ compositum
fomento		papaveris
Dens leonis	Leontodon taraxacum	
Elaterium	Succus spissatus momordicae elaterii	
Electuarium lenitivum	Electuarium sennae compositum	
mimosae catechu	catechu composisitum	
cassiae		Confectio cassiæ
scammonii		scammoneæ
sennae		sennæ
Elixir paregoricum	Tinctura opii ammoniata	
Anglorum	Tinctura opii camphorata	
sacrum	rhei et aloes	
salutis	sennae composita	
stomachicum	gentianae composita	
Emplastrum adhaesivum.	Emplastrum resinosum	
cereum	simplex	ceræ
lithargyri vel commune	oxidi plumbi semivitrei	plumbi
lithargyri compositum		galbani compositum
lithargyri cum hydrargyro		hydrargyri
lithargyri cum resina.		resinæ
picis Burgundicae compositum		picis compositum
vesicatorium	cantharidis vesicatoriae	Emplastrum lyttæ
Emulsio Arabica	Emulsio acaciae Arabicae	
communis	amgydalae communis	
Ferrum ammeniatum	Murias ammoniac et ferri	Ferrum ammoniatum
Ferri rubigo	Subcarbonas ferri	
squamae purificatae	Oxidum ferri nigrum purificatum	
praeparatae	praeparatum	
Ferrum vitriolatum	Sulphas ferri	Ferri sulphas
ustum	Oxidum ferri rubrum	
Filix mas	Aspidium filix mas	
Flores benzoës		Acidum benzoicum
Flores martiales	Murias ammoniae et ferri	
Flores sulphuris	Sulphur sublimatum	
loti		Sulphur lotum
zinci	Oxidum zinci	
Fœniculum dulce	Anethum fœniculum	Fœniculi semina
Galbanum	Gummi-resina bubonis galbani	
Gambogia		Gambogia
Genista	Spartium scoparium	Spartii cacumina
Gummi Arabicum	Gummi acaciae Arabicae	
Helleboraster, *folium*		Hellebori fœtidi folia
Helleborus albus	Veratrum album	Veratri radix
Hepar sulphuris	Sulphuretum potassae	
Hydrargyrus acetatus	Acetas hydrargyri	
calcinatus		Hydrargyri oxydum rubrum
muriatus		oxymurias
muriatus corrosivus	Murias hydrargyri *corrosivus*	
mitis	Submurias hydrargyri *mitis*, sive calomelas	
praecipitatus	Submurias hydrargyri praecipitatus	
nitratus ruber	Oxidum hydrargyri rubrum per acidum nitricum	nitrico-oxydum
praecipitatus cinereus	Oxidum bydrargyri cinereum	
sulphuratus niger	Sulphuretum hydrargyri nigrum	sulphuretum nigrum
sulpburatus ruber		sulphuretum rubrum
vitriolatus flavus	Subsulphas hydrargyri flavus	

Old Names.	*Names in the Edin. Pharm.*	*Names in the Lond. Pharm.*
Infusum amarum	Infusum gentianae compositum	
cinchonæ officinalis	cinchonae lancifoliae	
japonicum	acaciae catechu	
rosarum	rosae Gallicae	
tamarindi cum senna	sennae compositum	
Jalapa	Convolvulus jalapa	Jalapæ radix
Kali acetatum		Potassæ acetas
præparatum		subcarbonas
purum		Potassa fusa
sulphuratum		Potassæ sulphuretum
tartarizatum		tartras
vitriolatum		sulphas
Lac ammoniaci		Mistura ammoniaci
amygdalæ		amygdalarum
assafœtidæ		assafœtidæ
guaiaci		guaiaci
Lapis calaminaris	Carbonas zinci impurus	Calamina
Lavendula	Lavandula spica	
Laudanum liquidum	Tinctura opii	
Lignum campechense	Lignum haematoxyli campechiani	
Limon	Citrus medica	
Linimentum ammoniæ		Linimentum ammoniae subcarbonatis
Linimentum anodynum vel opiatum	Tinctura saponis et opii	
aquæ calcis	Oleum lini cum calce	
saponaceum	Tinctura saponis camphorata	
volatile	Oleum ammoniatum	
Linum, *semen*		Lini usitatissimi semina
Lithargyrus	Oxidum plumbi semivitreum	Plumbi oxydum semivitreum
Lixivia acetata	Acetas potassae	
e tartaro	Subcarbonas potassae purissimus	
purificata	Carbonas potassae	
tartarisata	Tartras potassae	
vitriolata	Sulphas potassae	
sulphurea	cum sulphure	
Lixivium causticum	Aqua potassae	
Magnesia alba	Carbonas magnesiae	Magnesiac carbonas
usta	Magnesia	sulphas
vitriolata	Sulphas magnesiae	Magnesia
Majorana	Origanum majorana	
Manna	Succus concretus fraxini orni	
Marmor album	Carbonas calcis durior	
Marrubium album		Marrubium
Mastiche	Resina pistachiae lentisci	
Mel acetatum		Oxymel simplex
Melampodium	Helleborus niger	
Mentha piperitis		Mentha piperita
sativa		viridis
Mercurius	Hydrargyrus	
præcipitatus ruber	Oxidum hydrargyri rubrum	
sublimatus corrosivus	Murias hydrargyri corrosivus	
Mezereum	Daphne mezereum	
Mimosa catechu	Acacia catechu	
Mimosa nilotica	Arabica	
Minium	Oxidum plumbi rubrum	
Mistura camphorata		Mistura camphorae
cretacea		cretae
moschata		moschi
Mucilago seminis cydonii mali		Decoctum cydoniae
Muria	Murias sodae	
Murias hydrargyri	Murias Hydrargyri corrosivus	
Natron præparatum		Sodae subcarbonas
tartarizatum		Soda tartarizata
vitriolatum		Sodae sulphas
Nitrum	Nitras potassae	Potassae nitras
Nux moschata	Nucleus myristicae moschatae	
Olea stillatitia	Olea volatilia	
Oleum succini rectificatum	Oleum succini purissimum	Oleum succini
terebinthinæ rectificatum	volatile pini purissimum	

Old Names.	*Names in the Edin. Pharm.*	*Names in the Lond. Pharm.*
Olibanum	Gummi-resina juniperi lyciae	
Oliva	Oleae Europeae	
Oxidum plumbi album	Carbonas plumbi	
Oxymel aeruginis		Linimentum aeruginis
Palma	Cocos butyracea	
Papaver album, *capsula*		Papaveris somniferi capsulae
erraticum, *flos.*		Rhœados petala
Petroleum Barbadense	Bitumen petroleum	
Pilulae aloes cum colocynthide	Pilulae colocynthidis compositae	
cupri	ammoniareti cupri	
opii		Pilulae saponis cum opio
scillae		scillae compositae
thebaicae	opiatae	
Pimenta	Myrtus pimenta	
Piper Indicum	Capsicum annuum	
Jamaicense	Fructus myrti pimentae	
Pix Burgundica	Pini resina sponte concreta	Pix arida
liquida	Resina empyreumatica	
Plumbum ustum	Oxidum plumbi semivitreum	
Polypodium filix mas	Aspidium filix mas	
Potio cretacea	Potio carbonatis calcis	
Prunus Gallica	Prunus domestica	
Pulegium	Mentha pulegium	
Pulvis aloës cum guaiaco		Pulvis aloës compositus
antimonialis	Oxidum antimonii cum phosphate calcis	
aromaticus		cinnamomi compositus
cretaceus	Pulvis carbonatis calcis compositus	
Doveri	ipecacuanhae et opii	
opiatus		cornu usti cum opio
Pyrethrum	Anthemis pyrethrum	
Raphanus rusticanus	Cochlearia armorica	Armoraciae radix
Rhabarbarum	Rheum	Rhei radix
Rosa pallida	Rosa centifolia	Rosae centifoliae petala
rubra	Gallica	Gallicae petala
Rubigo ferri praeparata	Subcarbonas ferri praeparatus	
Sabina	Juniperis sabina	
Saccharum non purificatum		Saccharum
Saccharum saturni	Acetas plumbi	
Sal alkalinus fixus fossilis	Subcarbonas sodae	
vegetabilis	potassae	
ammoniacus	Murias ammoniae	Ammoniae murias
catharticus amarus	Sulphas magnesiae	
cornu cervi	Subcarbonas ammoniae	
Glauberi	Sulphas sodae	
marinus Hispanus	Murias sodae	Sodae murias
polychrestus	Sulphas potassae cum sulphure	
Rupellensis	Tartras sodae et potassae	
succini	Acidum succinicum	
tartari	Subcarbonas potassae purissimus	
Santalum rubrum	Pterocarpus santalinus	Pterocarpi lignum
Santonicum	Artemisia santonicum	
Sarsaparilla	Smilax sarsaparilla	
Sassafras	Laurus sassafras	
Scammonium	Gummi-resina convolvuli scammoniae	Scammoniae gummi-resina
Seneka	Polygala senega	Senegae radix
Senna	Cassia senna	
Serpentaria Virginiana	Aristolochia serpentaria	Serpentariae radix
Simarouba	Quassia simaruba	
Sinapi Album	Sinapis alba	
Soda	Subcarbonas sodae	
muriata	Murias sodae	
phosphorata	Phosphas sodae	
tartarisata	Tartras sodae et potassae	
vitriolata	Sulphas sodae	
Solutio acetas zinci	Solutio acetatis zinci	
Sperma ceti		Cetaceum
Spina cervina, *bacca*		Rhamni baccae
Spiritus aetheris vitriolici	Æther sulphuricus cum alcohole	
ammoniae	Alcohol ammoniatum	
aromaticus	Tinctura aromatica ammoniata	
fœtidus	assafœtida ammoniata	

Old Names.	*Names in the Edin. Pharm.*	*Names in the Lond. Pharm.*
Spiritus cornu cervi	Solutio subcarbonatis ammoniae	
Mindereri	Aqua acetatis ammoniae	
salis ammoniaci	Solutio subcarbonatis ammoniae	
vinosus rectificatus	Alcohol fortius	Spiritus rectificatus
tenuior	dilutus	tenuior
camphoratus	Tinctura camphorae	camphorae
Staphisagria	Delphinium staphisagria	
Strammonium	Datura stramonium	
Submurias hydrargyri	Suhmurias hydrargyri mitis	
Sulphas aluminæ	Alumen	
Supertartris potassae	Supertartras potassae	
Sulphur antimonii praecipitatum auratum antimonii	Sulphuretum antimonii praecipitatum	Antimonii sulphuretum praecipitatum
Sulphuris flores		Sulphur sublimatum
Syrupus balsamicus vel Tolutanus	Syrupus toluiferae balsami	
limonum	citri medicae	
papaveris alhi	papaveris somniferi	
Taraxacum	Leontodon taraxacum	
Tartarus crudus	Supertartras potassae impurus	
Tartari crystalli	Supertartras potassae	Potassae supertartras
Tartarus emeticus	Tartras antimonii	
Tartarum solubile	potassae	
vitriolatum	Sulphas potassae	
Tartris antimonii	Tartras antimonii	
potassae	potassae	
et sodae	sodae et potassae	
Terebinthina Veneta	Resina liquida pini	
Terra Japonica	Extractum acaciae catechu	
ponderosa vitriolata	Sulphas harytae	
Thus		Abietis resina
Tinctura aloes vitriolata	Tinctura aloes aetherea	
aromatica	cinnamomi composita	
cantharidum	cantharidis vesicatoriae	
ferri	muriatis ferri	Tinctura ferri muriatis
Japonica	acaciae catechu	
opii camphorata		camphorae composita
rhei amara	rhei et gentianae	
sacra	Vinum aloes socotorinae	
saponis	Tinctura saponis camphorata	
Tolutana	toluiferae halsami	
Toxicodendron	Rhus toxicodendron	
Tragacantha	Astragalus tragacantha	
Trifolium palustre	Menyanthes trifoliata	Menyanthes
Trochisci Arabici	Trochisci gummosi	
Turpethum minerale	Subsulphas hydrargyri flavus	
Tutia	Oxidum zinci impurum	
Unguentum album vel cerussae	Unguentum carhonatis plumbi	
aeruginis	sub-acetatis cupri	
cœruleum	hydrargyri	
citrinum	nitratis hydrargyri	
epispasticum fortius	pulveris cantharidis vesicatoriae	
mitius	infusi cantharidis vesicatoriae	
picis		Unguentum picis liquidae
resinae flavae		Ceratum resinae flavae
Saturninum	acetatis plumhi	
spermatis ceti		Unguentum cetacei
tutiae	oxidi zinci impuri	
Uva passa	Fructus siccatus vitis viniferi	
ursi	Arhutus uva ursi	
Valeriana sylvestris	Valeriana officinalis	
Vinum amarum	Vinum gentianae compositum	
antimoniale	tartratis antimonii	Liquor antimonii tartarizati
Vitriolum album	Sulphas zinci	
cœruleum	cupri	Cupri sulphas
viride	ferri	

Old Names.	*Names in the Edin. Pharm.*	*Names in the Lond. Pharm.*
Winteranus cortex	Cortex Winterae aromaticae	
Zincum ustum	Oxidum zinci	Zinci oxydum
vitriolatum	Sulphas zinci	sulphas
Zingiber	Amomum zingiber	

TABLE II.

Names in the Edin. Pharm.	*Names in the Lond. Pharm.*	*Old Names.*
	Abietis resina	Thus
	Absinthium	Absinthium vulgare
Acacia Arabica	Acaciae gummi	Mimosa nilotica
catechu		catechu
Acetas hydrargyri		Hydrargyrus acetatus
potassae		Lixivia acetata, tartarum regeneratum
plumbi		Cerussa acetata, saccharum Saturni
	Acetosa	Acetosa pratensis
Acetum		Acidum acetosum
Acidum aceticum aromaticum		Acetum aromaticum
camphoratum		Acidum acetosum camphoratum
forte		acetosum forte
scilliticum		Acetum scillae maritimae
accticum tenue	Acidum aceticum	Acidum acetosum destillatum
	benzoicum	Flores benzoes
	nitricum	Acidum nitrosum
succinicum		Sal succini
sulphuricum	sulphuricum	Acidum vitriolicum
aromaticum		vitrioli aromaticum
Acorus calamus		Calamus aromaticus
Adeps ovillus		Sevum ovillum
suillus		Axungia porcina
Æther sulphuricus		Æther vitriolicus
cum alcohole		Spiritus aetheris vitriolici
Alcohol ammoniatum		Spiritus ammoniae
dilutius		Alcohol dilutum, spiritus vinosus tenuior
fortius		spiritus vinosus rectificatus *vel* purissimus
	Aloës spicatae extractum	Aloës socotorina, *Succus spissatus*
	vulgaris extractum	Barbadensis, *Succus spissatus*
Alumen		Sulphas aluminae
	Ammoniae murias	Sal ammoniacus
	subcarbonas	Ammonia praeparata
Ammoniaretum cupri		Cuprum ammoniacum
Amomum repens		Cardamomum minus
zingiber		Zingiber
Amygdali communis nucleus		Amygdala dulcis
Amyridis Gileadensis resina liquida		Balsamum Gileadense
Anethum fœniculum		Fœniculum dulce
Angelica Archangelica		Angelica sativa
Anthemis nobilis	Anthemidis flores	Chamaemelum
pyrethrum		Pyrethrum
	Antimonii sulphuretum	Antimonium
	sulphuretum praecipitatum	Sulphur antimonii praecipitatum
Apium petroselinum		Petroselinum
Aqua acetatis ammoniae		Aqua ammoniae acetatae, spiritus Mindereri
ammoniae		ammoniae causticae
potassae		lixivium causticum
Arbutus uva ursi		Uva ursi
Arctium lappa		Bardana

Names in the Edin. Pharm.	*Names in the Lond. Pharm.*	*Old Names.*
	Argenti nitras	Argentum nitratum
Aristolochia serpentaria		Serpentaria Virginiana
	Armoraciae radix	Raphanus rusticanus, *radix*
Artemisia absinthium		Absinthium
santonicum		Santonicum
Aspidium filix mas		Polypodium filix mas
Astragalus tragacantha		Tragacantha
Atropa belladonna		Belladonna, Solanum lethale
	Benzoïnum	Benzoë
Bitumen petroleum		Petroleum Barbadense
Boletus igniarius		Agaricus
Bonplandia trifoliata		Angustura
Bubonis galbani gummi-resina		Galbanum
	Calami radix	Calamus aromaticus, *radix*
	Calamina	Lapis calaminaris
	Calumbae radix	Colomba, *radix*
Calx		Calx viva
	Cambogia	Gambogia
	Canellae cortex	Canella alba, *cortex*
Cantharis vesicatoria		Meloë vesicatorius
Capsicum annuum	Capsici baccae	Piper Indicum
Carbonas barytæ		Barytes
calcis mollior		Creta alba
durior		Marmor album, et chelae et lapilli cancrorum
magnesiæ		Magnesia alba
plumbi		Cerussa, Oxidum plumbi album
zinci impurus		Lapis calaminaris
Carum carui		Carvi
Caryophylli		Carophyllus aromatica, *pericarpium immaturum*
Cassia senna	Cassiae pulpa	Senna
	Castoreum	Castoreum rossicum
	Ceratum plumbi compositum	Ceratum lithargyri acetati compositum
	resinae	Unguentum resinae flavae
	Cetaceum	Sperma ceti
		Carduus benedictus
Centaurea benedicta		
Chironia centaurium		Centaurium minus
Cinchona cordifolia	Cinchonae lancifoliae cortex	Cinchona flava
lancifolia	cordifoliae cortex	communis
oblongifolia	oblongifoliæ cortex	rubra
Cinchonæ officinalis cortex	Confectio aurantiorum	Cortex Peruvianus
Citrus aurantium		Aurantium Hispalense
medica	Coccus	Limon
Coccus cacti		Coccinella
Cochlearia armoracia		Raphanus rusticanus
Cocos butyracea	Confectio cassiae	Palma
	opii	Electuarium cassiae
	rosae caninae	Confectio opiata
	rosae gallicae	Conserva cynosbati
	scammoneae	rosae
	sennae	Electuarium scammonii
Conium maculatum	Conii folia	sennae
Convolvuli scammoniae gummi-resina		Cicuta
		Scammonium
Convolvulus jalapa		
Copaiferae officinalis resina liquida	Copaiba	Jalapa
		Balsamum copaibae
Croton eleutheria		
Cucumis colocynthis		Cascarilla
	Cupri sulphas	Colocynthis
	Cuspariae cortex	Vitriolum cœruleum
	Cydoniae semina	*Vulgo* cortex angusturae
		Cydonia malus, *semen*
Daphne mezereum		Mezereum
Datura stramonium		Stramonium
Decoctum guaiaci compositum	Decoctum cydoniae	Decoctum lignorum
	malvae compositum	Mucilago seminis cydonii mali
	papaveris	Decoctum pro enemate
		pro fomento
Delphinium staphisagria		Staphisagria
Dianthus caryophyllus		Caryophylla rubra
Dorstenia contrajerva	Elaterii poma	Contrajerva
		Cucumis agrestis, *fructus recens*
Emplastrum cantharidis		
vesicatoriae		Emplastrum vesicatorium

Names in the Edin. Pharm.	*Names in the Lond. Pharm.*	*Old Names.*
	Emplastrum ceræ	Emplastrum ceræ compositum
	galbani compositum	lithargyri compositum
	hydrargyri	lithargyri cum hydrargyro
Emplastrum oxidi ferri rubri		roborans
	picis compositum	picis Burgundicæ compositum
	lyttæ	cantharidis
plumbi semivitrei	plumbi	commune, *vel* lithargyri
	resinæ	lithargyri cum resina
Eugenia caryophyllata		Caryophyllus aromaticus
	Ferri sulphas	Ferrum vitriolatum
	Ferrum ammoniatum	ammoniacale
	Fœniculi semina	Fœniculum dulce, *semen*
Ferulæ assafœtidae gummi-resina		Assafœtida
Fraxini orni succus concretus		Manna
Gummi acaciæ Arabicæ		Gummi Arabicum
Hæmatoxyli Campechiani lignum		Lignum Campechense
Helleborus niger	Hellebori fœtidi folia	Melampodium
	Hydrargyri nitrico-oxydum	Hydrargyrus nitratus ruber
	oxydum rubrum	calcinatus
	oxymurias	muriatus
	submurias	Calomelas
	sulphuretum rubrum	Hydrargyrus sulphuratus ruber
	sulphuretum nigrum	cum sulphure
	Hydrargyrum praecipitatum album	Calx hydrargyri alba
Hydrargyrus		Argentum vivum, mercurius
Infusum acaciæ catechu		Infusum japonicum
Infusum sennæ compositum		Infusum tamarindi cum senna
	Jalapæ radix	Jalapium, *radix*
Juniperi lyciæ gummi-resina		Olibanum
Juniperus sabina		Sabina
Laurus cassia		Cassia lignea
cinnamomum		Cinnamomum
sassafras		Sassafras
Leontodon taraxacum		Dens leonis
	Linimentum ammoniæ subcarbonatis	Linimentum ammoniæ
	æruginis	Oxymel æruginis
	Lini usitatissimi semina	Linum, *semen*
	Liquor aluminis compositus	Aqua aluminis composita
	ammoniæ	ammoniæ puræ
	ammoniæ acetatis	ammoniæ acetatæ
	antimonii tartarizati	Vinum antimonii tartarizati
	calcis	Aqua calcis
	cupri ammoniati	cupri ammoniati
	plumbi subacetatis	lithargyri acetati
	plumbi subacetatis dilutus	lithargyri acetati composita
	potassæ	kali puri
	Lytta	Cantharis
Magnesia	Magnesia	Magnesia usta
	Magnesiæ carbonas	alba
	sulphas	vitriolata
	Marrubium	Marrubium album
Melaleuca leucadendron		Cajeputa
	Mentha piperita	Mentha piperitis
	viridis	sativa
Mentha pulegium		Pulegium
Menyanthes trifoliata	Menyanthes	Trifolium palustre
	Mistura amygdalarum	Lac amygdalæ
	ammoniaci	ammoniaci
	assafœtidæ	Lac assafœtidæ
	camphoræ	Mistura camphorata
	cretæ	cretacea
	guaiaci	Lac guaiaci
	moschi	Mistura moschata

Names in the Edin. Pharm.	*Names in the Lond. Pharm.*	*Old Names.*
Murias ammoniæ		Ammonia muriata, sal ammoniacus
Murias ammoniæ et ferri		Ferrum ammoniatum, flores martiales
hydrargyri *corrosivus*		Mercurius sublimatus corrosivus
sodæ		Soda muriata, sal marinus, muria
Myroxyli Peruiferi balsamum		Balsamum Peruvianum
Myrtus pimenta		Pimenta
Nitras argenti		Argentum nitratum, causticum lunare
potassæ		Nitrum
Olea fixa		Olea expressa
volatilia		stillatitia *vel* essentialia
	Oleum succini	Oleum succini rectificatum
Origanum majorana		Majorana
Oxidum antimonii cum phosphate calcis		Pulvis antimonialis, antimonium calcareo-phosphoratum
arsenici		Arsenicum
ferri nigrum		Ferri squamæ
ferri rubrum		Ferrum vitriolatum ustum, colcothar vitrioli
hydrargyri cinereum		Hydrargyrus præcipitatus cinereus
Oxidum hydrargyri rubrum per acidum nitricum		nitratus ruber, *vel* præcipitatus ruber
plumbi rubrum		Minium, plumbum ustum rubrum
semivitreum		Lythargyrus, plumbum ustum
zinci		Zincum, ustum, flores zinci
impurum		Tutia
	Oxymel simplex	Mel acetatum
	Papaveris somniferi capsulæ	Papaver album, *capsula*
Phosphas sodæ		Soda phosphorata
Pilulæ colocynthidis compositæ		Pilulæ aloes cum colocynthide
opiatæ		Pilulae opii *vel* thebaicae
	Pilulæ saponis cum opio	opii
	scillæ compositæ	scillae
Pimpinella anisum		Anisum
Pini balsameæ resina liquida		Balsamum Canadense
oleum volatile		Oleum terebinthinae
resina empyreumatica		Pix liquida
resina liquida		Terebinthina veneta, et vulgaris
solida, oleo volatile privata		Resina alba
solida sponte concreta	Pix arida	Pix Burgundica
Pistaciæ lentisci resina		Mastiche
	Plumbi superacetatis	Cerussa acetata
	subcarbonas	Cerussa
	oxidum semivitreum	Lithargyrus
Polygala senega		Seneca
Polygonum bistorta		Bistorta
Potassa		Causticum commune acerrimum
cum calce	Potassa cum calce	mitius
	fusa	Kali purum
	impura	Cineres clavellati
	Potassæ acetas	Kali acetatum
	nitras	Nitrum
	subcarbonas	Kali praeparatum
	tartras	tartarizatum
	sulphas	vitriolatum
	sulphuretum	sulphuratum
	supertartras	Tartari crystalli
Potio carbonatis calcis		Potio cretacea
	Pruna gallica	Pruna
Pterocarpus santalinus	Pterocarpi lignum	Santalum rubrum
	Pulvis aloes compositus	Pulvis aloes cum guaiaco
Pulvis carbonatis calcis compositus		Pulvis cretaceus
	cinnamomi compositus	aromaticus
	cornu usti cum opio	opiatus
ipecacuanhæ et opii		ipecacuanhae compositus *vel* Doveri
aluminis compositus		sulphatis aluminae compositus *vel* stypticus

Names in the Edin. Pharm.	*Names in the Lond. Pharm.*	*Old Names.*
Quassia simarouba		Simarouba
	Rhamni baccae	Spina cervina, *baccae*
	Rhei radix	Rhabarbarum, *radix*
	Rhœaddos petala	Papaver erraticum, *flos*
Rhus toxicodendron		Toxicodendron
Rosa canina	Rosae caninae pulpa	Cynosbatos
centifolia	centifoliae petala	Rosa pallida
Gallica	Gallicae petala	rubra
	Saccharum	Saccharum non purificatum
	Scammoneae gummi-resina	Scammonium, *gummi-resina*
	Senegae radix	Seneka, *radix*
	Serpentariae radix	Serpentaria virginiana, *radix*
Smilax sarsaparilla		Sarsaparilla
	Soda impura	Barilla
	tartarizata	Natron tartarizatum
	Sodae murias	Sal muriaticus
	sulphas	Natron vitriolatum
Solutio subcarbonatis ammoniæ		Aqua carbonatis ammoniae spiritus cornu cervi
sulphatis cupri composita		Aqua cupri vitriolati composita *vel* styptica
Spartium scoparium	Spartii cacumina	Genista
	Spiritus camphorae	Spiritus camphoratus
	rectificatus	vinosus rectificatus
	tenuior	vinosus tenuior
Styracis benzoini balsamum		Benzoinum
Subacetas cupri		Ærugo
Subboras sodæ	Sodae subboras	Borax, boras sodae
Subcarbonas ammoniæ	subcarbonas	Ammonia praeparata, sal cornu cervi
ferri		Rubigo ferri, carbonas ferri
potassæ		Carbonas potassae
sodæ		sodae
Submurias hydrargyri *mitis*		Hydrargyrus muriatus mitis, calomelas
hydrargyri præcipitatus		Hydrargyrus muriatus praecipitatus
Subsulphas hydrargyri flavus		Hydrargyrus vitriolatus flavus, turpethum minerale
Sulphas cupri		Cuprum vitriolatum, vitriolum cœruleum
ferri		Ferrum vitriolatum, vitriolum viride
magnesiæ		Magnesia vitriolata, sal catharticus amarus
potassæ		Lixiva vitriolata, tartarum vitriolatum
cum sulphure		Lixiva vitriolata sulphurea, sal polychrestus
sodæ		Soda vitriolata, sal glauberi
zinci		Zincum vitriolatum, vitriolum album
		Flores sulphuris loti
	Sulphur lotum	Sulphuris flores
Sulphur sublimatum	sublimatum	Antimonium
Sulphuretum antimonii		Sulphur antimonii praecipitatum *vel* auratum
antimonii praecipitatum		
hydrargyri rubrum		Cinnabaris factitia
hydrargyri nigrum		Hydrargyrus sulphuratus niger, aethiops mineralis
potassæ		Hepar sulphuris
Supertartras potassæ impurus		Tartarus crudus
potassæ		Tartarus purificatus, crystalli tartari
Syrupus toluiferæ balsami		Syrupus balsamicus
Tartras antimonii		Antimonium tartarizatum, tartarus emeticus
potassæ		Lixiva tartarizata, tartarum solubile
sodæ et potassæ		Soda tartarizata, sal Rupellensis
	Terebinthinae Canadensis	Balsamum Canadense
Tinctura aromatica ammoniata		Alcohol ammoniatum aromaticum
assafœtidae ammoniata		ammoniatum fœtidum
benzoini composita		Balsamum traumaticum
camphorae		Spiritus vinosus camphoratus

Names in the Edin. Pharm.	*Names in the Lond. Pharm.*	*Old Names.*
	Tinctura camphoræ composita	Tinctura opii camphorata
Tinctura gentianæ composita		Elixir stomachicum
muriatis ferri	ferri muriatis	Tinctura ferri *vel* martis
opii		Laudanum liquidum, tinctura thebaica
opii ammoniata		Elixir paregoricum
opii camphorata		Anglorum
rhei at aloes		sacrum
rhei et gentianæ		Tinctura rhei amara
saponis camphorata		Linimentum saponaceum
et opii		anodynum
sennæ composita		Elixir salutis
Toluifera balsamum		Balsamum tolutanum
	Unguentum cetacei	Unguentum spermatis ceti
	picis liquidæ	picis
Unguentum nitratis hydrargyri fortius		citrinum
Veratrum album	Veratri radix	Helleborus albus
Vinum aloes soctorinæ		Vinum aloeticum, tinctura sacra
gentianæ compositum		amarum
tartratis antimonii		antimonii tartarizati vinum antimoniale
	Zinci oxydum	Zincum calcinatum
	sulphas	vitriolatum

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